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"Gothic Architecture."

SO much has been said and written of late years on Gothic architecture, and so much done in its illustration, that it is perhaps hardly possible for a new writer to hope to draw attention to new disquisition on the subject except by being paradoxical. We do not quite make out whether Mr. C. H. Moore's book,* which dates from the (now) æsthetic shades of Cambridge, Massachusetts, and is published on both sides of the water, is intended more especially for English or for American readers. If for the latter, and if it be adopted as a text-book by them, it is rather a dangerous one, since it takes a very one-sided view of the subject. If it is intended for English readers, it can hardly be a success, for a great deal of the reasoning about Gothic architecture, which is put forth in the book with much solemnity and importance is so familiar in England now that it is almost a commonplace: and the greater part of what is new in the book will be at once recognised by English readers as, if not paradoxical, at least involving a curiously distorted representation of the facts in order to support an adopted theory.

We may admit at once that the book is both ably written and well illustrated, and that there is evidence of great pains and study having been given to its production. The author evidently writes for the most part from direct study and observation of the buildings referred to, and many of the excellent illustrative sketches with which it abounds are reproduced from his own drawings made on the spot. It is essentially a student's book, not one for the general public, who will not be likely (in this country at least) either to understand or care for the demonstrations and diagrams of various methods of vaulting and buttressing. It is perhaps as well they should not, for if a book like this became popular at Mudie's, we know very well that the paradoxical and heretical element in it is exactly what the general reader would lay hold of at once, and parrot about everywhere. Architectural students are not liable to be carried away in the same manner.

The author appears to have laid out his book with the special object of showing that there is, properly speaking, no Gothic architecture at all out of France. In leading up to this position he goes into a demonstration of various critical views which may possibly be new to American readers, but are certainly not new in England. That the pointed arch is not an entirely essential element in the character of Gothic architecture has been long recognised, though it must still be held that its employment in place of the round arch constitutes so important a change in the architectural expression of a building as to justify the strong line of demarcation which was drawn by Rickman and succeeding classifiers of Gothic between the round-arched and the pointed periods. That France is the central home and birthplace of Gothic architecture has been also long admitted in this country. But Mr. Moore is satisfied with nothing less than denying the term "Gothic" to either English or German architecture, on grounds which have no doubt a show of logic as the writer puts them, but which show is mainly achieved by putting undue stress on a single element in architecture, and shutting the eyes to a number of others which, if they are none of them, perhaps, as important separately as the one which the author emphasises, are collectively of the highest importance in their co-ordinate effect upon style.

The proposition which Mr. Moore lays down is that Gothic architecture is essentially a system of building by equipoise, of reducing all the walls to the mere skeleton framework which is necessary to construction; of treating all this structural framework, architecturally, in such a manner as to express its function, and admitting no members into the architecture which do not form an expression of constructive function. In leading up to this conclusion the author goes through the old demonstration of the gradual development of the buttress system from the Roman through the Romanesque to the fully developed Gothic, much as it has been illustrated by other writers before him; his demonstration is clearly made, but contains no new point of any kind. The special point in his deduction is that, instead of regarding Gothic architecture as a special and recognisable artistic form of architectural design, he regards it only as consisting in a particular form of building, represented by the typical French cathedral. It is, he tells the reader, a building in which the plan consists of a nave and side aisles, terminated eastwards either by a polygon or a semicircle around which the aisles are continued. "The vaults are furnished with a complete set of ribs—namely transverse ribs, diagonal ribs, and longitudinal ribs. These ribs are independent arches, of which the transverse and longitudinal ones are pointed, while the diagonals are usually round; and upon them the vault masonry rests—the one never being incorporated with the other. The ribs spring from slender shafts, compactly grouped, and often detached, though having their bases and capitals incorporated with the great piers which rise from the pavement, through the successive stories, to the nave cornice. . . . Upon the piers are concentrated all the side pressures of the vaults, but these side pressures are so neutralised by the buttressing that the piers require only to be massive enough to bear the weight of the vaults. The clearstory buttresses, which receive the thrust of the nave vaults, are reinforced by flying buttresses springing over the aisle roofs, and rising from the vast outer buttresses, which are incorporated with the respond piers of the aisles. The walls, required for enclosure only, are reduced to a minimum of thickness, and are confined to the ground story, and to the spandrels of the arcades."

These sentences form the salient portions of a series of definitions of Gothic architecture, of which we have not space to quote the whole. The author adds, "It will thus be seen that the full development of the Gothic system is brought out only where the plan of the building includes a central nave and side aisles." No doubt the full system of building by equipoise is only fully developed in such a building; and Mr. Moore adds, as will be seen above, that a Gothic building has a polygonal or semicircular termination eastwards. That is to say, a Gothic building is a French cathedral; and we observe in fact that in another portion of the book the author distinctly asserts that Gothic is a church style only, and was only developed in ecclesiastical buildings, and apparently only in French ecclesiastical buildings, and of these, only in three-aisled buildings! The Sainte-Chapelle, he graciously admits, is Gothic as far as it goes, or at least such a building "may be" Gothic, but only in an inferior sense. Only by the use of the flying buttress, in connexion with that of the pointed arch in the ribs of the vault, "is

* Development and Character of Gothic Architecture. By Charles Herbert Moore. London and New York: Macmillan & Co.: 1890.

the Gothic attenuation of supports rendered possible."

The plain meaning of all this is that the author has carried to excess an important principle in regard to the definition of architectural style, which was no doubt comparatively neglected and passed over by English architectural critics earlier in the century, viz.: that a true style demands the consistent carrying out and expression of one predominating principle of construction. It is true that this consistency of construction and of constructive expression is the most important element in style. But to select one form only of that construction, to ignore all others, and to ignore the whole combined effect of detail, general design, and feeling, in influencing and giving distinctive character to a style, is to carry this constructional logic to an absurd and unphilosophical excess. It reduces itself, in fact, merely to a readjustment of nomenclature. We have been accustomed to apply the term "Gothic" to a certain style of architecture prevalent over great part of Northern Europe during the Middle Ages, and the main characteristics of which, some of them capable of distinct definition, some of them rather felt by the perception than definable in words, are quite familiar to all who have paid any attention to architecture and architectural style. No one who has done so has any doubt as to the kind of architectural art represented to his intellectual perception under the term "Gothic architecture." Mr. Moore proposes to restrict this nomenclature from henceforth to one class of buildings, the construction of which shows the most complete carrying out of the constructive system of equipoise of weights. All the other innumerable buildings in which this system has not been carried out fully and on the same plan are not Gothic. Then what are they? We presume King's Chapel is architecture; architecture moreover of remarkable completeness and consistency of design. If it is not Gothic, what is it? Is Mr. Moore prepared with a new nomenclature? Or what is Cologne Cathedral? or the west front of Peterborough (a somewhat important architectural production)? Mr. Moore, self-satisfied and dogmatic as he is in his style of writing, can hardly expect that the world will allow him to sweep away these buildings, and Lichfield, and Lincoln, and Canterbury, and Salisbury, &c., &c., out of the category of architecture (Westminster we observe he gives a kind of grudging allowance to, because it resembles French work to some extent). Then what style are they?

Gothic architecture is the great antithesis to Greek in the history of the art. The absurdity of Mr. Moore's manner of reasoning and classifying as to style may be best shown by applying a similar logic to Greek architecture. Let us say, then, that Greek architecture is represented by a type of building of entirely trabeated construction, consisting of an oblong chamber called a *cella*, enclosed by solid walls, sometimes divided into two apartments by a cross wall; it is surrounded externally by a colonnade of columns standing free, and supporting a lintel and cornice, and supporting also cross lintels from the wall of the *cella*, which carry a coffered ceiling, the whole forming a covered aisle round the exterior of the building, which is absolutely symmetrical in regard to its two sides. The whole combined width of the *cella* and the aisles is covered by a sloping roof in one span, the end of which forms a triangular framework for decorative sculpture at each extremity of the building. This is the only true and complete form of Greek architecture, which is essentially a temple architecture. *Ergo*, the Erechtheion and the monument of Lysicrates are not Greek architecture. One of them contains three compartments of different sizes irregularly tacked on to each other, and both of them exhibit engaged columns or pilasters. This is not a whit more one-sided or illogical than Mr. Moore's position as to Gothic architecture.

The fallacy in both cases consists in resting the definition of style on some elements of a building and ignoring others which are of nearly equal importance. Greek architecture is a consistently trabeated style; Gothic architecture a consistently arched style. Those are the broad facts of the constructive basis of each. To this we may add the differentiation, in the case of Gothic, that it is a style in which the thrust of the arched roof is collected on certain points of the walls, forming buttresses, instead of thrusting against the whole length of a thick wall (for this gives a character to the whole architecture radically different from that of a barrel-vaulted building with continuous walls), and this involves the pointed arch, because only with the pointed arch can we practically carry out the vaulted roof. And the pointed arch being thus thrust upon us by practical necessity in one part of the building, we must employ it throughout in order to lay claim to completeness of style. Otherwise, and but for these practical difficulties with vaulting, we might have a building in all essentials of style purely Gothic, carried out with round arches throughout. Our author's further argument is that as the arch is a form of construction supported by abutments, and not exercising vertical pressure, the complete realisation of the system is only attained when the building is reduced entirely to a system of constructional frame-work of arches and abutments, any walls between these points being only walls of enclosure unconnected with, or at least not necessary to, the construction. This is true in a certain sense, no doubt: but two important considerations seem to have been overlooked. In the first place, it does not always follow that the most complete carrying out of a system to its logical conclusion produces the most satisfactory artistic result. As a matter of fact it has been questioned by architectural critics whose judgment is worth respect at all events, whether the system of reducing the piers to the smallest possible area and propping everything with a scaffolding of flying buttresses, which has been carried out so completely in many typical French cathedrals, is really consistent with the highest aims and the highest expression of architecture; whether it is not devoid of the repose, the calm, and the dignity which should characterise the highest class of architectural monuments; and if so, then it is a questionable credit to French Gothic to have carried out a system to its utmost logical development at the expense of monumental mass and solidity of expression. The other point that seems to have been overlooked is the importance of mouldings and ornamental details in characterising style. This is, of course, not so easy to define as a matter of construction; but it is not the less important on that account. As in the case of the Erechtheion above referred to, the mouldings and the style of ornament and the general feeling of the whole design connect a building with a certain recognised style, in spite of important differences in general plan and construction. In like manner an English Gothic church or cathedral, although not cut down to the lowest limit of pier area and not dependent on a scaffolding of flying buttresses, is nevertheless, in its general character and detail, a building in the same style as the French Cathedral; and it is really a *reductio ad absurdum* to say otherwise.

It must be observed also that while Mr. Moore is never tired of picking out the logical defects of English architecture, he appears completely blind to defects of logical design in French architecture. He quotes (in illustrations) a bay of the Cathedral of Senlis as showing how the ground plan was laid out and the sections of piers determined by the intended plan of the vaulting, entirely ignoring the fact of the intermediate circular pier having no suggestion on plan of the transverse groins of the sexpartite vaulting, or the fact of the vaulting shaft for this beginning over again, with a new base of its own, from the abacus of the ground story cylindrical pier. This system of placing little bases for the vaulting shafts on the abacus of the lower piers, which was more used in Early French Gothic than anywhere else, is in fact one of the most illogical and distinctly un-Gothic features in Early Gothic architecture; it entirely breaks the connection between the vaulting and the ground story, and very materially weakens the homogeneous character of the design; yet this the author passes over without reprobation, and even in silence, because it is a French defect. The theory that Gothic architecture is only a church architecture it is half amusing and half vexatious to see brought up again now, after the great lights of the English Gothic revival had spent so much strenuous pleading in trying to convince people of the contrary. They perhaps carried their theory a little too far in claiming that Gothic was equally suitable for any form of building; and of course we know that all the great works of Gothic architecture as a matter of fact were churches; but we find refectories and hospitals built on the same principle; a pretty clear proof that the actual workers out of the style did not look on it as an exclusively church architecture: and this appears to us, in fact, to be putting the accidental before the essential.

The only really new point we have noticed in the book, besides the general and paradoxical view of Gothic of which we have been speaking, is Mr. Moore's suggestion (page 60 *et seq.*) as to a reason for keeping the springing of the wall rib adjoining the clearstory windows much higher than the springing of the free vaulting ribs, thus producing that curious "ploughshare" form of vaulting in the severy between the wall-rib and the diagonal rib, with which we are all familiar. This has generally been regarded merely as a device for cutting out as much of the clearstory as possible into a window; but the author points out some examples, and illustrates one from St. Leu d'Esserent, in which the window does not fill up the space within the wall-rib, but there is a certain degree of wall-space between the vaulting rib and the jamb of the clearstory window. Mr. Moore's view is that the object of stilting the wall arch and thus cutting back and narrowing the severy of the vault, was to confine the pressure of the vault against the wall within a narrow space, and he ingeniously points out that in his sketch from St. Leu d'Esserent the flying buttress outside is seen abutting against the wall just at the level of this stilt of the wall-rib. There is certainly reason in this, and it is a very clever suggestion worth considering; though, when the author speaks rather contemptuously of Scott for not having perceived it, and for having said that the stilting was only done to make a larger window, we should like to have heard what Scott would have to adduce in reply, and whether he in his turn could not have brought forward examples to show that the theory was untenable. However, it is worth attention and Mr. Moore is to be thanked for it; it is new and ingenious, but we are not convinced of its truth. We may observe in regard to the example given, that though the window is smaller than the space left for it, the architects might have had in view, in stilting the wall-rib, the more harmonious effect of a line concentric with the main line of the window-arch. And we may also observe that if the explanation is really what Mr. Moore suggests, it must be accepted considerably at the expense of the logical character of his beloved Gothic style, in which the builders laid out on plan quadripartite or sexpartite vaults which they could not actually carry out on the spreading and symmetrical lines of the plan, from inability to get over a constructive danger.

The criticisms which Mr. Moore makes on English Gothic are in some cases valuable and interesting; but one cannot lose sight of the fact that the chapters devoted to it are almost one continuous string of fault-finding and of picking out, in various matters of detail, undoubted weaknesses of English Gothic and representing them as typical. To say that

the Early English capital is "rarely a capital of good profile" is nonsense; and to give such an example as fig. 146, as a typical one, is "saying the thing which is not." Of such a grand portal as Peterborough he has nothing to say except a passing allusion to it in mentioning one or two German churches with triple aisles of equal height, which he strongly condemns, and says the only parallel to it is the grouping at the west front of Peterborough, which is not a parallel case; while Bristol, which he does not seem to know, is one. The condemnation of the façade of Lincoln, on account of its not representing the three-aisled section in the rear of it, is a criticism to which there is another side. Lincoln façade is unfortunately a patchwork of different dates, and therefore as it stands is in some respects hardly a fair specimen of this method of treatment; but there is something to be said for the method, in spite of its falsity in one sense. This class of façade is really a great decorative "stop" to a form of section which it is exceedingly difficult to treat in a grandiose manner if frankly shown; and we do not know that it is to be by any means regarded as an incontrovertible architectural truth that a building with a nave and lean-to side-aisles should not have this awkward form masked by a decorative screen. We are disposed to think, at all events, that Lincoln west front is more effective as it is than it would be if treated à la Pisa, as the author thinks it ought to have been.

There is a good deal of very clever and even brilliant writing in this book, and those portions in which the author explains and illustrates special features of Gothic architecture, such as the vault, in the generally accepted manner and without trying to twist new theories out of them, have the merit of saying what the author's predecessors have said before, in a better, clearer, and more incisive way than many of them have attained to. But in its general scope the book seems to be a curious illustration of the admiration for things French, both social and artistic, which has of late years taken possession of the American mind, coupled with a desire to "take the shine out of the Britisher." No persons in the same line of business are so jealous of each other as relations; and the feeling seems to be that if Americans have no old cathedrals of their own to boast, it is at least desirable to let "the Britisher" know what poor concerns his really are, after all. Now the discreet Britisher is quite alive to the fact that France is the centre and birthplace of Gothic architecture, and that the great Gothic monuments of France are superior to ours in scale and in monumental expression, and in some respects in completeness of method. But we consider also that a great deal of English Gothic has an artistic beauty and refinement peculiar to itself in character, and which makes it superior to French work in some points, though it is inferior perhaps in more important ones. Of the author's blindness to these English characteristics it is sufficient to note that he has not a word to say about so graceful and characteristic an invention as fan-vaulting, or such a unique and complete work as King's Chapel; and, as before observed, passes over such a façade as Peterborough with an implied sneer. He is obviously an architectural student of no small ability and industry, and might have produced what would have been a typical text-book of its class on the subject of Gothic architecture. He has unfortunately spoiled the success of his own work by weighting it with paradox and prejudice.

Moscow. — According to the *Moskauer Deutsche Zeitung*, the sewage system of the town is to undergo a thorough re-organisation. In accordance to the wishes of the authorities, a scheme has been worked out by a committee consisting of five engineers of repute and one of the civic officials, and the plans are now to be laid before the representatives of the town for adoption.

THE MAINTENANCE OF COUNTY ROADS.

BY THE REV. E. ELMHIRST, J.P.*

I READ with very great interest and with general approval an article in your publication of February 1, from the pen of Major-General Luard, R.E., treating of the various proposals for the future maintenance of county roads. Very properly General Luard lays great stress upon the fact that the condition of the roads in the counties surrounding the Metropolis is a matter of no small moment to the inhabitants of the Great City. Good roads, however, are of immense benefit to the entire community. And, looking at the general condition of roads in many parts of England, it would be, as the *Times* puts it, of the greatest benefit to this country, and most of all to the more remote and more unattractive parts, if the roads were all much improved, and rendered not only passable but even pleasurable to travellers. People are so accustomed to bowl along without any other sensation than that of easy motion, that they cannot bear the perpetual discomfort and occasional peril of deep ruts and big stones. In the interest of society the whole country ought to be brought within the reach of every vehicle and every horse at all fit to be used. And that does not apply to carriages and horses of a certain description only, but also to all vehicles and horses. By having good roads the draught is reduced; and a less number of horses will do a given amount of work, thereby reducing the cost of the work, and saving damage to carriage, waggon, cart, and horse of the traveller, the farmer, and the general user of the road.

The necessity of good roads everywhere being undisputed, the next question is, "Under what system can we best ensure having them?" Turnpike trustees, through the agency of competent surveyors, and with funds collected from the users of the roads, were, in not very far remote times, responsible for the repairs. But since the abolition of toll-gates, on the expiration of the Turnpike Trusts, the several turnpike roads were at once repaired by the parishes through which they passed; they became main roads, or where Highway Districts were established were repaired by the Highway District Boards, aided by contribution from the County and the Consolidated Funds; but now they are under the direction of the County Councils in each county. The ordinary highways are repaired by the parishes in those counties wherein no Highway Districts have been established, or by the Highway District Boards where they are established under the present state of the law. Speaking of the ordinary highways, our only choice is between the old parochial system, where the roads are repaired by the parish surveyor, and the highway district system. The parochial system I once heard described by a former Member of Parliament for Leicestershire who had mastered the road question, and who, when it was proposed to dissolve a Highway District Board in this county, exclaimed, "Nobody would wish to return to that old, crude, dark, unenlightened system, which was a curse to the roads of this county, and is still a curse to the roads of every county that remains under it."

Since the creation of County Councils the repair of the main roads is, by sec. 11, subsec. 4, under their direction. Every road in a county which is for the time being a main road, shall be wholly maintained and repaired by the Council of the county in which the road is situated, and such Council shall have the same powers as a Highway Board. And whenever District Councils shall be established, they may contract for the undertaking by the *District Council* of the maintenance of any main road, and if the County Council so require, the District Council shall undertake the same. I observe that the County Council of Kent propose to contract with Highway Authorities for the repair of the main roads in the East Kent district, and with private firms for the repairs in the West Kent district. It may be well to adopt the plan, as far as the East Kent district is concerned, but we cannot say; the scheme has not had time for trial; but as to that for the West Kent district, if I might presume to say so, I have no confidence in it. The question also arises, Does the Act sanction such contracts with private firms? The County Council can contract with Highway Authorities or with District Councils whenever they shall be constituted; but can County Councils contract with "private firms" so as to come within the terms of the section? I have my doubts; but I will not discuss the point further; it would be unbecoming in me to call in question the action of my brother County Councillors of another county.

To go back to what I asked,—What is the system we have to resort to for the repair of the roads, main and ordinary? The parochial system is condemned. There is the other alternative, under the present law,—the "Highway District." On my preference for that I have on many former occasions, and in many ways,—by speech, by pamphlets, by periodical reports of the working of the system in my own county, Leicester,—and by my evidence before the Select Committee of the House of Lords on the Highway Acts,—spoken with no uncertain sound, and it would be wearisome to repeat it. Let me guard myself by saying, I have spoken always with an eye to the present law, but never contended that it was beyond amendment. I am now confronted by General Luard's proposed amendment, but it is too extensive to admit of a minute examination in the space you would be able to allot to me.

Not only has General Luard thrown out suggestions for an alteration in the Highways and Locomotives law, but the County Surveyor of Hertfordshire, Mr. Urban A. Smith, contributed a very sound and practical article upon the subject in the *County Council Magazine* of January in the present year.

These two proposed amendments in the law are worthy of close examination. They differ materially from one another. The General suggests the grouping, or "uniting the highway districts, even as the parishes have been united." Each Board to be represented on the County Roads Committee, or Board, which, in such case, would be composed partly of County Councillors and partly of *ex officio* delegates, in some cases the chosen representative of the Board being the Councillor for the district. The legislative distinction between main roads and ordinary roads no longer to exist. This was pointedly recognised by the Committee of the House of Lords in their Report on the Highway Acts in 1881, p. xxi., *if the proceeds of some local tax could be contributed by the county in aid of highway rates.*

Mr. Urban Smith, amongst other objections to the present state of the law, alludes to the Act of 1878, which provided that all the expenses incurred by a Highway Board in any parish should be deemed to be incurred for the common benefit of the whole district, and should be a charge upon the general district fund. Although, says he, the soundness of this provision appears unquestionable, the effect was that, whereas, prior to 1878, the majority of waywardens on a Board had no interest in opposing proper expenditure in any individual parish after the passing of the Act of 1878, they seemed to have felt that they had a direct interest in avoiding expenditure which must be met from the common fund. Mr. Smith goes on to observe that the only remedy for this state of things is to be found in having under one competent management an area sufficiently large to admit of an intelligent and uniform system being adopted—large enough to enable a proper staff to be employed; large enough to free the governing body from petty local influences; large enough to admit of machinery being employed where desirable; and large enough to secure as chief surveyor

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* And Member of the County Council of Leicestershire.

an engineer possessing technical knowledge, administrative ability, and sufficient status to enable him to carry on his duties. The whole of the roads in the county, he maintains, would be far more easily and economically maintained by such a Board than by making the fruitless effort of getting at the desired result through the medium of District Boards and their surveyors. The system has to a certain extent been tested in Ireland, Scotland, South Wales, and the Isle of Wight, as well as under the French Government, and with general success.

A scheme of a similar character, though limited to the maintenance of main roads, has been recently submitted to the Highway Committee of the Leicestershire County Council by the County Surveyor; but as the repair of the main roads has been entrusted to the Highway Districts for the coming year, the scheme of the County Surveyor stands over for the time.

In any comments upon General Luard's schemes for the maintenance of county roads, it is necessary to bear in mind the present state of the law which limits the power of dealing with the two classes of roads,—namely the main and the ordinary roads. Were our hands clear to propound and adopt any scheme whatever that we might deem most advisable, our difficulties would be vastly diminished; but, as the law now stands, we are fettered by diversities of operations which stand in our way. We have the diverse system of the old parochial Highway Surveyor, the Highway District system, and the new County Council system, which latter authority at present deals only with main roads. I need not dwell on the almost obsolete parochial system, which must very shortly give way to a more enlightened one. I know that the Highway District system has its faults and its opponents; ostensibly in the charge that is brought against it, that by the Highways and Locomotives (Amendment) Act of 1878, all expenses incurred by a Highway Board in any parish are to be deemed to be incurred for the common benefit of the whole district, and be made a charge upon the general district fund. Although the soundness of this last-mentioned provision appears unquestionable the effect was (observes Mr. Urban Smith, the County Surveyor of Hertfordshire) that prior to 1878 the majority of waywardens on a Board had no interest in opposing proper expenditure in any individual parish; after the passing of the new Act they seem to have felt that they had a direct interest in avoiding expenditure which must be met from the common fund. This alteration in the law appears, says Mr. Smith, to have been a severe blow to the Highway Board system, and many districts have since been dissolved. The maladministration of the functions of Highway Boards has never, I am glad to say, been exhibited in the Highway Board of Lutterworth, with which I am connected, though I cannot dispute the impeachment elsewhere.

The institution of County Councils now forces itself upon our serious consideration, inasmuch as the entire control of the main roads has been taken out of the hands of the other two authorities above-mentioned, and it will be necessary to deal only with this last-constituted authority in the remarks which I have to make bearing upon the maintenance of main roads. Though the repair of the main roads is thus thrown upon the County Council, the prospect of the institution of District Councils at no distant time, and the want of special organisation for undertaking this important work, have induced the County Council to shift the burden of the work from their own shoulders, in some counties at least, and to request the highway authorities, who have hitherto performed the work, to continue to repair the main roads for a certain period,—in some instances a twelvemonth,—recouping the Highway Authorities the expenses incurred. The County Council of Leicestershire has adopted that course. In Gloucestershire, however, as stated by Sir John Dorrington, Bart., M.P., and Chairman of the County Council, the Council undertook on "the appointed day" the administration of all the main roads in the county, and so far have every reason to be satisfied that their roads are as well maintained as in the past, and with the prospect,—almost the certainty,—of spending less by 6,000*l.* in the twelve months than was paid in the previous year to effect the same result. Sir John Dorrington informs us that nine other counties have taken the same course, either from the first, or more recently, and that many others are contemplating similar action. It would occupy too large a space in your columns to give a detail of the mode in which all appointments of officers and all expenses are managed; but these are very simple, and present no difficulty, being under the charge and control of the Highway Committee of the County Council.

General Luard, not approving of the scheme of the Committee for Roads and Bridges in Kent, which they had evolved for the future management of the main roads of the county, which they had laid before the Council of that county, and which consisted, as already observed, of two plans,—one for contracting with Highway Authorities, the other for contracting with private firms,—made certain suggestions in opposition to those plans; amongst them was one that "The Highway Boards of Kent be invited to form a Roads Union under the auspices of the County Council." These suggestions were not accepted by the Council, the Council probably having in view, according to the promise of the Local Government Board, the introduction at the earliest opportunity of the District Councils Bill. Passing on from the consideration of what has been done in some of the counties, in conformity with the law as at present in existence, I should like to glance at some of the suggestions which have been made by General Luard, by Mr. Urban Smith and others, for an alteration of the law as regards all roads, both main and ordinary highways.

I will preface their suggestions by declaring that, in my opinion, there comes in now a very wide question upon the subject of the roads. Has not the time arrived for reviewing the present state of the law, and for calling upon the legislature to amend the various enactments connected with the highways? Is it not time that the recommendation of the Select Committee of the House of Lords on Highway Acts in the Session of 1881 should be adopted, and relief given in the terms of their report, which runs thus:—"In view of the great hardship complained of by ratepayers of the charge of half the cost of the main roads upon the county rate fund under the existing system, the Committee are of opinion that *it is desirable to abolish the distinction between main roads, as defined by the Act of* 1878, *and ordinary highways.*" In the event of this taking place, the proceeds of some local tax, apportioned according to the mileage of roads, might be contributed by the county in aid of the highway rates. In the promised District Council Measure it is to be hoped that provision will be made for undertaking the repair, not only of main roads, but also of all ordinary roads. The distinction, as General Luard remarks, is one which has always proved exceedingly difficult to define, and the necessity for it, at all events, no longer exists.

Royal Marylebone Theatre.—This house, together with Nos. 67 and 69, Church-street, Paddington, will be put up for sale by auction, at the Mart, on Thursday, the 27th instant. Latterly known as the "Royal Alfred," this once popular place of resort was opened as a "penny house" in 1842, but was enlarged in 1854. It is distinguished by the unusual depth of its stage, and covering an area of 9,000 ft. superficial, accommodates an audience of 2,000 persons. The premises are held for a term, whereof thirty-one years are yet unexpired, and are let at a present rental of 988*l.*, which will shortly be raised to 1,040*l.* per annum.

NOTES.

THE important discussion on Mr. Slater's paper, at the last meeting of the Institute of Architects, which was kept technically "private," and of which therefore we gave no report, is now in the hands of members of the Institute, and those who were not present at the meeting will probably agree, on reading the discussion, that it was well that the unwise and rather reckless proposition to send a copy of this *mélange* of differing opinions to the County Council, as a spur to their interests in building legislation, was quashed. We can imagine nothing less likely either to promote the cause of a wise reform in building legislation, or to contribute to the dignity and status of the Institute of British Architects, than to send before the County Council a report of a meeting the general result of which would be to show that there were many differences of opinion on the subject among members, and which included no definite proposition or resolution as the expression of the meeting. If the Institute of Architects wish, as no doubt they ought to wish, to influence in what they believe to be the right direction any impending reform in building legislation, they should crystallise the result of their deliberations on the subject into definite propositions representing the opinion of the majority of a meeting formally adopted and put on record. If they wish to be heard with respect by the London County Council, let them exhibit to that body their unanimity, and not their differences. But in regard to any chance of wise and effectual Parliamentary reform in building legislation, there is one very important consideration to be borne in mind, viz., that it is no use whatever to come before Parliament with a Bill for improvement *and* codification of the existing building law combined. Any attempt to do so would result in debates which only further complicate and entangle the whole subject,—

"And find no end, in wandering mazes lost."

What is necessary is first to get such separate improvements in detail passed as are necessary, as new subsidiary Acts. Then, and not till then, will be the time to come before Parliament and say "the existing building legislation is now good in itself, but inconveniently dispersed through a number of various enactments: these represent what we want; now codify these." That is the only way to set about a permanent and satisfactory settlement of building legislation.

THE anticipations expressed by the counsel for the railway companies, that their evidence at the Board of Trade inquiry might be made use of for other purposes, has very soon been realised,—though not exactly in the manner they apprehended, or, indeed, to their prejudice. At the recent conference between the coalowners and their employés, held for the purpose of discussing the wages question, the men, as is well known, pressed for a 10 per cent. advance on the strength of the increased charges for coal. "The price paid by the public is the barometer which indicates the prices," urged the men. "House-coal represents but a small proportion of the output," replied the masters. "The bulk of the coal is disposed of to gasworks and railway companies, and is subject to long contracts." Upon this the men appealed to the evidence given by Mr. Findlay, who had stated at the Board of Trade inquiry that the London and North-Western Railway were paying 20 to 30 per cent. increase upon their coal; while Mr. Shaw had stated that the Lancashire and Yorkshire would have to pay an advance of 4s. 4½d. a ton upon their new contracts. On the other hand, the evidence of Welsh colliery proprietors might have been quoted. It was stated that in many cases the Welsh collieries were worked at an absolute loss, it being remarked that the railway companies always charged their full maximum rates unless they had a purpose of their own to serve by adopting a different policy.

This evidence, however, had not been given at the time the conference was held. Mr. Jeune, Q.C., is representing the coal-owners before the Board of Trade, and he also alluded to this part of the railway case. He considers that the companies are so protected by the contract system that they should not be given such a margin for contingencies as that to which they lay claim. He suggests that in the event of anything quite unexpected happening, the proper course would be for them to go to Parliament and make out a case. The companies doubtless consider that they are before Parliament now, and that they are, at considerable expense, making out a case now, in order to provide for "the unexpected," without having to go all over the ground again at some future time. Lord Balfour and Mr. Courtenay Boyle are getting well furnished with figures; too well, probably, for, as far as figures go, each side has made out an exceedingly strong case.

THE scheme for the amalgamation of the South-Eastern and London, Chatham, and Dover Railways, which is aired periodically, has received a severe check,—if not a death-blow. A circular was recently sent to the proprietors of the former company by Messrs Arthur Anderson & Co., setting forth the desirability of such an amalgamation; upon which a letter was addressed by the South-Eastern Secretary to the London, Chatham, and Dover Board, the greater part of which was taken up,—to use the words of the *Times*,—with the amenities which usually appear in correspondence between these companies. It contained, however, among other matters, a definite suggestion as to arbitration upon the Continental agreements between the two companies, which have long been a source of contention. The adoption of these proposals, it was urged, "would remove the friction which must continually recur while the common fund is depleted by competition, and would at the same time smooth the way for any complete fusion of receipts which might be deemed in accordance with public policy." A reply has just been sent to the proposals, which, so far from being accepted, are spoken of by the London, Chatham, and Dover Board as being utterly impracticable and impossible of attainment. The Continental agreement alluded to, works, presumably, in their favour,—indeed, the decisions of the Law Courts point in this direction,—and they decline most emphatically to submit to its revision. The letter is anything but a "soft answer," and the relations between these two southern lines will not have been at all improved by this attempt,—if it can really be so described,—to arrive at an understanding.

A VERY interesting and important report has been made by Mr. St. John Hope to the Corporation of Leeds in regard to the state of the ruins of Kirkstall Abbey, of which the Corporation are the custodians. Mr. Hope finds various parts of the building in a condition in which they require attention and repair in order to prevent further decay and downfall. The principal repairs recommended in the report are these: The walls of the presbytery, which are decayed in the upper part by percolation of water, should be carefully pointed. The gable is falling outwards and should be under-pinned. The tower has nothing to support it on the north side, and the slightest failure or a violent gale might bring it down. Mr. Hope thinks the only thing that can be done is to rebuild the fallen pier and arches, and the wall above, so far as to afford an efficient buttress to the tower. "The old stones might be used as far as they will go, and the deficiency made up with new, only roughly hewn into form, so as to mark it as a modern repair." The clearstory of the nave should be freed from ivy, and the aisle walls pointed to prevent further percolation of water. The report goes very fully into the condition of the ruins of the conventual buildings and the steps desirable to be taken to prevent them becoming further dilapidated. The whole report forms an interesting and valuable record of the present state of Kirkstall. The work suggested may cost some money no doubt to carry out, but we do not suppose the Corporation of Leeds will grudge that. If they do, however, they might apply to Lord Grimthorpe, who will be willing, very likely, to remove the present ruins and build a brand new and superior abbey from his own design, or that of his builder.

A LETTER from Dr. Waldstein to the Roman correspondent of the *Times* (March 6) gives some very valuable further information as to the important discoveries made last year at Lykosura in Arcadia, by Mr. Kabbadias; discoveries, it will be remembered, we commented on last October. A considerable proportion of the sculptures have now been transported—no easy matter—from Arcadia to the Central Museum at Athens, where, though they are not yet exposed to the public view, Dr. Waldstein has inspected them. The temple excavated was dedicated to Despoina (Persephone), and we may remind our readers that Pausanias describes in detail the great cultus statue, or, rather, group of four statues, that stood within it. He says, "The images of the goddesses Despoina and Demeter, and the throne on which they are seated, and the footstool below their feet, are all of one and the same stone, and neither any portion of the drapery nor the decorations are fixed or clamped in, but the whole is one block. And this stone was not brought from a distance, but was dug up in the precinct, in accordance with a dream, and each of the images is about the size of the image of the Mother at Athens, and they are the work of Damophon. Demeter carries a torch in her right hand, and she has laid her other hand on Despoina; and Despoina holds a sceptre, and has on her knees what is called a cista, and this she holds with her right hand. And on one side of the throne near Demeter stands Artemis, wearing the skin of a deer, and a quiver on her shoulders, and in one hand she holds a torch, in the other two snakes; by Artemis is a hunting dog; and near the image of Despoina stands Anytos, represented as a man in armour." Pausanias proceeds to tell the story of Anytos. With the help of this full description, it is confidently hoped that the main composition of the whole group may be completely restored. It is scarcely possible to over-estimate the importance of the discovery. As Dr. Waldstein points out, we have here for the first time "an original *agalma*—a genuine temple statue of a good Greek period, which we can identify with a noted local artist, Damophon of Messene," who flourished about the middle of the fifth century B.C. "What most struck me," he adds, "were some large fragments of drapery belonging to the colossal figures. The folding is beautifully free, and one piece is decorated with figures of Nikès and Tritons, in very flat relief, reminding one of gold *repoussé* work. There is one still larger fragment with flowers, worked in similar relief. There can be no doubt that all this class of work is a reminiscence of the gold and ivory statuary carried over to the marble work of the fourth century." Wholly in the dark as we are on the chryselephantine technique, and without hope of the recovery of a single fragment, this echo of it is simply invaluable.

THE first issue of the Corpus of ancient sarcophagos reliefs is promised almost immediately, and its publication will mark a distinct epoch in archæological method. The corpus of reliefs is to be one of a series of works undertaken by the German Archæological Institute, in which all salient examples of particular classes of antiquities are to be published collectively. Gerhard's work on Etruscan mirrors was the prototype of the series, but his example was for many years not followed. What has long been done systematically for inscriptions must be done for certain branches of sculpture, for terra-cottas, for vases, &c. Until it is done, archæologists can not be said to have their material in manageable form. The first series is, according to a too prevalent German custom, the second volume of the whole publication. It is to deal with such sarcophagi as represent complete mythological cycles. The volume is to be edited by Dr. Carl Robert, whose name is a sufficient guarantee for the brilliancy as well as thoroughness of the text. It is to consist of 222 pages of text, 65 whole plates, partly copper, partly heliotype according to the subject, and 293 smaller cuts in the text. This volume is to be followed at no long intervals by five others, embodying the reliefs that treat of "Daily life" of "Individual myths of the Bacchic cycle," the "Muses, Nereids and Erotes," and "Decorative subjects." We hope there will be some arrangement by which the volumes (225 marks each) can be had separately.

TWO drawings — exterior and interior views—are now on view at St. Saviour's Church, Southwark, showing the proposed new nave, as designed by Sir Arthur Blomfield. It is to be of seven bays, with aisles and clearstory, the lines both of exterior and interior following pretty closely those of the existing choir. There is a south porch projecting but slightly beyond the aisle walls, and at the outer angles of the west end are two bold octagonal turrets carried up clear of the aisle parapets, and terminating in conical lead roofs. Lancets occur throughout the design, single lights in the clearstory and aisles, and a triplet at the west end. The two western bays of the nave are emphasised by a larger column and an arch spanning the centre aisle, and dividing them from the other five. We are informed that this feature occurred in the old nave, and it serves to break the long lines of the church, although not apparently placed for any structural purpose. The whole scheme is an attempt to bring the appearance of the church back to what it was in the thirteenth century, and if there is a lack of originality, the result will certainly be dignified, and make St. Saviour's one of the finest of the London churches. It is calculated that about 50,000*l.* is necessary for its proper completion, of which a little over 20,000*l.* has been already subscribed.

THE Society of Antiquaries issue a circular stating that they are endeavouring to found a "Research Fund" by raising a capital the interest of which should from time to time be applied towards the expense of excavations on ancient sites, "or in such other methods of advancing archæological knowledge as the President and Council of the Society may think fit." The Society consider that a capital of 3,000*l.* would enable them to do much useful work; and towards this they are already able to announce subscriptions to the amount of 1,750*l.* We hope they will receive every support, even to a far greater extent than the 3,000*l.* spoken of, for the idea is an excellent one, and would do something towards supplying help which is often much wanted and vainly looked for towards the prosecution of researches of the highest interest in archæology and of course our enlightened Government is too wide-awake to "practical" considerations to assist in such schemes. As an example we may call attention to the appeal made in a letter from Mr. Penrose in another column, for assistance in illustrating the Byzantine antiquities of Greece. If the Society of Antiquaries Fund were formed and in operation this would be almost an ideal case for assistance.

AN interesting paper was read before the Geological Society on Wednesday last by Mr. W. Whitaker, F.R.S., of the Geological Survey, in which the author described certain irregularities in the occurrence of superficial deposits in the eastern counties, which have seriously interfered with the calculation of the depth of projected wells. It appears that a series of superficial clays, sands, and gravels lies in a valley

on the chalk, and a line of wells has been sunk into them, in some cases to 200 ft. or 300 ft. without reaching the chalk. This great thickness of superficial deposits is very unusual, and there is nothing at the surface to indicate the circumstance. The chalk comes to the surface only a few hundred feet off, and under ordinary conditions the well-sinkers might reasonably have expected to reach the chalk at less than 60 ft. or so. It seems that a ravine has been cut by natural agencies through the chalk, which ravine was subsequently filled up by the superficial deposits in question. It is an excellent illustration of the difficulty sometimes experienced in accurately estimating the thickness of strata to be passed through in well-boring, though fortunately the phenomenon does not often occur.

THE annual Schinkel Competition for the medallion and travelling studentship, the highest honour attainable in Germany by competition, has been won by Herr "Regierungs-Bauführer" T. Boethke, who is at present on the staff of a well-known Government Bureau at Leipsic. The subject (a Royal College for Music on the Lützow Platz, Berlin), although as interesting a one as any architect could wish for, only enticed two competitors to send in designs, and of these two, one was a mere absurdity. Herr Boethke's, on the contrary (although it shows some mistakes in the planning and little originality in the design), may be termed an excellent, as well as exceedingly laborious, piece of work for so young a member of the profession. The elevations are in a strict Palladian renaissance; the planning, which has been worked out on academical lines, shows that the author was well acquainted with the plans of the new Concert House at Leipsic, and those of the new Imperial Law Courts which are being built in the same town.

THE vacant place of "Dombaumeister"* at Strasburg has already been filled up, Herr Franz Schmidt, of Cologne, having been elected to hold this very responsible post. We here find the somewhat rare occurrence of a master being chosen to take the place of his former pupil. August Hartel had worked under Herr Franz Schmidt from 1863—1868, at the time when the latter artist was occupied with his great publication of the Cologne Cathedral; and it was really during this period that the then young architect, thanks to the kind advice and directions of his "chef," formed that sound basis of knowledge of German Gothic which afterwards brought him so much fame. The new "Dombaumeister" (who has already reached his sixtieth year) is well known in German architectural circles, and is considered to be one of the leading Gothic architects of Prussia, his occupation at Cologne being the only cause of his name not having such publicity as that of his pupil.

AN interesting description is given in a foreign contemporary (*Dingler's Polytechnisches Journal*, vol. cclxvii., p. 194) of a chimney built on loose soil; thus rendering a light structure necessary. From the foundation four upright, and somewhat tapering, lattice girders were carried up, and connected together by cross-bracing. On the inner edge of the frame thus formed the chimney proper was built of tiles, about 5 in. in thickness, and having lap-joints. Angle iron bands were introduced at intervals to bind the whole firmly together. The total height of the chimney is 140 ft., and the inside diameter 8 ft. 6 in. The total weight is 543 tons; which gives a pressure of 17 lb. per square inch on the foundation. This would be about equal to half the weight and pressure per square inch of an ordinary chimney. The whole chimney was erected in thirty-nine days, the iron work occupying thirty-one days of the time. The cost is set down at 19,200 f., and it is estimated that a brick chimney of the same height and size would have cost 14,300 f.

IN the Transactions of the Institution of Civil Engineers (Vol. xcii.) are some particulars of tests made by two American experimenters, Messrs. W. R. Nichols and J. K. Russell, to ascertain the action of water on galvanised iron pipes, such as are fitted for the Boston (Mass.) water service. It is generally possible to detect zinc in water which has passed through any considerable length of zinc-coated pipe; but it has been thought that the quantity in suspension as a hydro-carbonate, or in solution, is too small to be an objection from a sanitary point of view. Messrs. Nichols and Russell's experiments were made with a length of 39 ft. of ½-in. galvanised pipe, connected in such a manner that water could be introduced into the pipe to displace that which had been already standing there, but without allowing air to enter. Zinc was found, in solution and suspension, whenever the water had stood in the pipes from seven to seventy hours. Water that had remained in the pipe for several days did not contain zinc in solution in greater proportion than for shorter periods, but the quantity of zinc in suspension was augmented. The water held in solution was 0·3 to 0·6 parts of zinc per 100,000 parts of water, and in suspension from 1·5 to 2 parts per 100,000 parts of water; or 0·3 grain per gallon in solution, and 1·0 grain per gallon in suspension. In water in regular flow no zinc was discovered.

THE Duke of Newcastle's Worksop Manor estate, in Nottinghamshire, will be offered for sale by auction in the course of the ensuing season. This freehold property, extending over some 6,000 acres, to be divided into lots, lies in Bassetlaw wapentake, at the northern side of Sherwood Forest. The existing manor house stands on high ground, in a finely-timbered park of about 200 acres; to the south is a range of hills, known as Manor Woods. The sale will include the Lodge (312 acres), Shireoaks Park (368 acres), twenty farms, with houses and homesteads, pasture ground, some building land adjoining the town, together with Worksop and Shireoaks Manors, and the market dues and tolls of Worksop itself. The manor,—held in turn by the De Lovetots, the Furnivals, the Talbots, Earls of Shrewsbury, and the Howards, Dukes of Norfolk,—was sold in 1843 by Henry, thirteenth Duke of Norfolk, for, it is said, 380,000*l.* to the Duke of Newcastle; and the manor-house was afterwards partially dismantled. The Priory Church,—strictly speaking of Radford,—was founded, 3 Henry I., by William de Lovetot, for some Augustine Canons, and dedicated to St. Mary the Virgin. Its present dedication to St. Mary and St. Cuthbert reminds us that De Lovetot had taken the parish church for his priory and that the parishioners, as at Crowland, Ely, Ripon, and elsewhere, subsequently enjoyed for their own use its western portion. The church is conspicuous for its two western and large central towers and long nave of ten bays, cruelly restored about thirty-five years ago. Its architectural features are described in the letterpress to a two-page illustration, published in the *Builder* on July 14, 1888, of Messrs. Carpenter & Ingelow's design for rehabilitating the fabric eastwards of the central tower.

STAINED glass will shortly be fixed in the west window of Chesterfield church. It has been executed by Messrs. Heaton, Butler, & Bayne, and consists of large figure subjects from the Life of Joshua. The window itself is [of seven lights, but the glass has been treated pictorially, and the subjects extend across three of the lights on either side, the centre being occupied by a figure of Moses on Mount Sinai. There are a large number of figures, and the general effect, although fine in colour, and the figures in many cases powerfully drawn, is somewhat crowded, and it is doubtful whether a more conventional and decorative treatment would not have been more suitable.

AS will be seen in our lists of "Tenders" printed last week, Mr. Rowland Plumbe has been engaged by the Governors to make plans for some extensive alterations and additions to the London Hospital. This hospital represents the "London Infirmary," originally established in the year 1740, at a large house in Prescot-street, Whitechapel. In 1758 the hospital was incorporated, and shortly afterwards removed to its present premises in Whitechapel-road, just eastwards of "the Mount." The Mount derived its name from having been formerly the situation of one of the numerous forts upon the environment of earthworks that were thrown up around London in the winter of 1642-3, the King's headquarters being then at Oxford. This particular fort they called the Horn-work, or Mill Mount, as standing close to the mill in Whitechapel-road. It lay on the curtain between two other forts on the east side of London,—one at the Hill by the northern end of Brick-lane, another in Old Gravel-lane, Ratcliff (St. George's-in-the-East). Mount-street, Grosvenor-square, commemorates the site and name of "Oliver's Mount," upon the same line of circumvallation; hard by stood another, having four bastions, where is now Hamilton-place, Piccadilly. Some suppose that Castle,—renamed four years ago Furnival,—street, was so styled from the fort which was constructed in Holborn.

MR. CHAMBERLAIN affords us the latest example of the necessity under which those who are termed "public men" seem now to feel placed, of talking about art on some occasion or other. They are not all, however, as amusing as he is. The spectacle of Mr. Chamberlain solemnly explaining to the Birmingham Jewellers' and Silversmiths' Association that the ancient jewellers' art of Egypt and Greece was "not barbarous or savage" is as good as anything we have come across for some time back. We sincerely hope it will not escape the notice of *Punch*. No: if Mr. Chamberlain had wanted to give an illustration of "barbarous and savage" goldsmiths' art he could have referred his hearers to some examples of their own native manufacture, which have managed on some pretext to get exposed in the cases of the Birmingham Art Gallery. We observe Mr. Chamberlain in his speech always spoke of jewellers' work as a "trade"; like the manufacture of screws, we presume. In Birmingham no doubt jewellery is a trade; in Greece it was an art; and that makes all the difference.

THE PROPOSED BLACKWALL TUNNEL.

THE question of constructing a tunnel or tunnels beneath the Thames at Blackwall, for the accommodation of vehicular and pedestrian traffic between the right and left banks of the Thames is an exceedingly difficult one, and the London County Council are acting wisely in giving careful consideration to the subject. It will be remembered that it was upon this question that, very nearly a year ago, the "appointed day" for the extinction of the Metropolitan Board of Works was accelerated by some ten days, the late Board having, in its last week of existence, accepted a tender, amounting to 318,840*l.*, for the construction of a footway tunnel only at this part of the river, the proposed footway tunnel being intended as the preliminary and trial portion of the complete tunnel scheme, which included, besides this footway tunnel, two larger tunnels for vehicular traffic. The then newly-elected body, the London County Council, which was about to take over the government of London from the Metropolitan Board of Works, objected, and rightly so, to be saddled by their predecessors with so heavy a responsibility as the tunnel scheme involved, just as they were entering upon office, and before they had had time to consider the project, and their objection gained additional weight from the fact that the designer of the tunnel, Sir Joseph Bazalgette, the Engineer to the Board, had resigned his appointment, and would not supervise the construction of the tunnel.

That some permanent means of crossing the river at or near this point ought to be provided,

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* See *Builder*, March 8, 1890.

if possible, seems very clear. The Select Committee of the House of Commons on Thames Communications below London-bridge, appointed in 1884, reported in favour of a bridge near the Tower (now being constructed by the Corporation of London), a bridge or tunnel at Shadwell, and a tunnel at Blackwall. The Metropolitan Board of Works, in 1886, determined to obtain power to construct a tunnel at Blackwall.

It was to its determination to commit its successors to this scheme that the late Metropolitan Board of Works owed its somewhat premature decease as a body corporate, under the circumstances already referred to. Defenders of the Board's conduct in that matter were not wanting at the time. The Board, they said, had given years of consideration to the subject, and had come to their resolution on the advice of their Engineer, the practicability of whose project was testified to by other eminent engineers who were examined by the House of Commons Committee on the Thames Tunnel (Blackwall) Bill, which became an Act in 1887. Having obtained their Act, the Board considered themselves bound to proceed with the works, in fulfilment of pledges given to the local authorities of the eastern and south-eastern portions of London. There was, of course, a great deal to be said for that view of the situation, and we hope that if it should now be determined to proceed with the tunnel, the results will be such as to justify the action of the late Board, and even to realise the hope, expressed by some of its admirers, that its action in this matter would "keep its memory green."

When the London County Council entered upon office, the Bridges Committee was charged with the consideration of the late Board's Blackwall Tunnel scheme, and at the meeting of the Council on April 11 last year they presented a report stating that they had had under consideration the subject of the formation of the proposed foot-tunnel at Blackwall, for which a tender amounting to 318,840*l.* (including approaches), was accepted by the late Metropolitan Board; and had also considered as to the construction of the two tunnels for vehicular traffic, which, together with the foot-tunnel, were estimated to cost about 1,500,000*l.* The Committee had also had submitted to them a scheme for a single tunnel of sufficient dimensions to accommodate two lines of vehicles and foot-passengers, and an estimate of the cost, amounting to about 1,200,000*l.* The Committee thought it desirable that the Council should have an independent opinion upon the relative merits of these two schemes. They therefore recommended:—

"That the reports, plans, specifications, and estimates of the three tunnels authorised by the Thames Tunnel (Blackwall) Act, 1887, together with the scheme for a single tunnel to accommodate two lines of vehicles and foot passengers, be referred to an eminent engineer for examination and report."

This was agreed to, although not without an attempt to further shelve the question by the advocates of a ferry.

At the meeting of the Council on June 22 last, the Bridges Committee reported that they had proceeded upon the resolution of the Council of May 7, instructing them to take into consideration the report of the Committee appointed by the House of Commons in 1884, expressing the opinion that three means of communication were absolutely necessary east of London Bridge, viz., a bridge at or near the Tower, a tunnel at Shadwell, and a tunnel at Blackwall, and to advise the Council which of the latter should be first constructed. The Committee, in considering the matter, had had regard to the fact that an Act of Parliament had been obtained for the construction of a tunnel at Blackwall, and that contracts had been entered into and purchases completed for property required for the approaches amounting, approximately, to 150,000*l.* The Committee recommended:—

"That the Blackwall tunnel take precedence of all other schemes of trans-communication, and that the Committee be instructed to consider the other schemes proposed, with a view of reporting as to their probable cost, and as to the order in point of time in which they shall be proceeded with."

This recommendation was agreed to.

Subsequently, at a meeting of the Council held on July 2 last, it was resolved, on the recommendation of the Bridges Committee, that Mr. Wolfe Barry be retained to advise the Council upon the scheme for the construction of the proposed tunnel or tunnels.

Mr. Wolfe Barry's report to the Bridges Committee is now before us. The reference to Mr. Barry recited the following among other particulars:—The Act of 1887 authorised the late Metropolitan Board of Works to construct a tunnel at this part of the river; it also allowed the Board to make the tunnel, if they thought fit, by either two or three separate borings, so that the tunnel might consist either of two separate and parallel tunnels for vehicular and foot traffic, or of two separate tunnels for vehicular traffic and a third for foot traffic. The size of the two tunnels for vehicular traffic was 23 ft. internal diameter, and the foot passenger tunnel was to be 15 ft. internal diameter, and to have a headway of 10 ft. The Parliamentary estimate for that portion of one footway and the two carriage tunnels, which would be constructed under compressed air, was 768,000*l.*, and the total estimate was 1,124,000*l.* for works. The estimate laid before Parliament for the whole of the scheme, including the purchase of property, was 1,568,200*l.* Towards the end of 1888 the Board invited tenders for the construction of a footway tunnel of cast-iron lined with brick-work, with approaches thereto on both sides of the river, partly in tunnel and partly in cut and cover and open cutting. Two tenders only were received,—one from Messrs. S. Pearson & Son, amounting to 354,513*l.*, and one from Mr. W. Webster, amounting to 357,604*l.* The engineer's estimate was 280,000*l.* As the lowest of these tenders was so greatly in excess of the Engineer's estimate, the Board resolved to re-advertise for tenders, and to omit the words, in clause 21 of the specification, to the effect that the contractor would not be allowed an extra charge for any modifications in the method adopted. The result was that three tenders only were sent in, viz., Messrs. Kirk & Randall, 348,212*l.* 3*s.*; Mr. W. Webster and M. Coiseau, 327,745*l.*; and Messrs. S. Pearson & Son, 318,840*l.* The London County Council, upon taking over the duties of the late Board, declined to confirm the acceptance of the tender for the construction of the pedestrian tunnel, and the Bridges Committee directed the [acting] Engineer to submit to them sketch-drawings and an estimate for a tunnel which would accommodate two lines of vehicles and foot passengers. He recommended that the tunnel should be 22 ft. in diameter, and constructed within 5 ft. of the bed of the river. The method proposed for constructing this tunnel was the same as that proposed for the 15 ft. pedestrian tunnel. The total length of the subway, with its approaches, was nearly three miles, of which 10,794 ft. would be constructed upon the surface or by open excavations. The Engineer's estimate for the 22 ft. combined vehicular and pedestrian tunnel was 1,113,000*l.* The Bridges Committee asked Mr. Barry to advise them (1) as to the practicability of the schemes as set out; (2) as to the most economical way to provide for the traffic, *i.e.* one or more tunnels, and the dimensions he would recommend to be adopted, having regard to (*a*) first cost of construction, and (*b*) cost of maintenance, including lighting, draining, ventilating, and safeguarding by police; (3) as to drawing the specification in such a form as to provide for two prices,—one for undertaking the whole of the work and risk connected with the execution of the contract, and the other for the execution of the contract with the provision of a certain sum for pumping, such sum to be increased or lessened upon the certificate of the Engineer, as the necessity for greater or less expenditure in pumping might arise; and (4) generally.

Mr. Wolfe Barry, in his report, says, as to the practicability of the schemes set out in the terms of reference, that the nature of the soil below the bed of the river has been to some extent ascertained by borings which have been made at various points on each side of the river, and at four places in the bed of the river itself. The nature of the soil, consisting as it does of alternate bands of clay and sand, is anything but favourable to tunnelling operations, and contrasts very greatly in this respect with the impervious stratum of London clay through which tunnels have been made near London Bridge. Mr. Wolfe Barry goes on to say that there are very few examples of tunnels constructed through water-bearing strata such as exist at Blackwall. There is, of course, the well-known example of the old Thames Tunnel, which extraordinary engineering work was constructed before the days of the pneumatic system of construction. A large part of the Thames Tunnel was made through ground superior to that at Blackwall. Another well-known example is the partially-completed double tunnel under the Hudson River. This work, constructed on the pneumatic system, but without a shield, is not nearer to the bed of the river than from 12 ft. to 15 ft. The Severn and Mersey tunnels, so far as construction is concerned, are not cases in point, as the rock through which they pass is so widely different from the soil under the Thames at Blackwall that the use of any pneumatic system was unnecessary. The Tower Subway and the City and Southwark Subway, being wholly in the impervious London clay, were made without difficulty, and without the use of any special appliances.*

We quote the next two paragraphs of Mr. Wolfe Barry's report *in extenso*:—

"It is clear that at Blackwall, tunnelling by the pneumatic system is the only plan which promises success. There are numerous examples of the success of this system in the sinking of the foundations of piers, but in considering its application to a tunnel, this important difference has to be borne in mind, viz., that when working in a vertical direction, as in the case of cylinders or caissons for bridge piers, the external and internal pressures are approximately equal over the whole of the surface of ground exposed, whereas in tunnelling horizontally under water or through pervious strata, the external pressure of water will be considerably greater at the bottom of the tunnel than at the top. The pressure of air must of course be at least equal to the highest external pressure, and there is thus a great tendency for the air-pressure within the work to escape along the line of least resistance, that is, from near the top of the tunnel. The result of any such sudden escape is what is known as a 'blow,' when the air issues from the tunnel faster than the pumps can supply it; the water, as a consequence, rushes into the tunnel, and carries with it large quantities of soil. Thus any large exposure of surface in constructing a tunnel gives rise to difficulties and dangers, and these considerations point to the necessity for a shield which will not only limit the surface exposed at any one time, but which also can be so arranged that the air-pressure in its various divisions can be graduated to the external pressure opposite each division. The designs submitted to me in connexion with the footway tunnel contemplate the employment of such a shield as would render these precautions possible.

The details of the best shield require much anxious thought, and the most advantageous design will probably not be arrived at except after a certain amount of experiment; but I am of opinion that an efficient shield can be designed and constructed, under which larger tunnels than those already designed for the Metropolitan Board of Works can be carried out."

Mr. Wolfe Barry then proceeds to consider in detail the two proposals of the footway tunnel and the tunnel for combined vehicular and foot traffic. As to the smaller or footway tunnel, he considers that a tunnel of this nature is practicable, "considered as an engineering work," but he thinks that some important modifications of the proposed shield would be necessary. He is also of opinion that the top of the extrados of the arch should not be nearer to the bed of the river when dredged than 10 ft.; any less depth would, he thinks, give rise to greatly-increased difficulties of construction, and would be a source of serious danger to the tunnel when finished. Of course, depressing the tunnel will increase the gradients. Mr. Wolfe Barry also is of opinion that the larger tunnel which had been suggested by the acting Engineer of the Council is practicable as an engineering work, but he does not think that it would satisfactorily accommodate the traffic. He believes that a tunnel large enough for vehicular traffic can be made which will accommodate the footway traffic without serious addition to the size which is necessary for vehicular traffic alone.

As to the second head of the terms of reference, the most economical way of providing for the traffic, whether by the construction of one or more tunnels, Mr. Wolfe Barry says that this question is governed by the question of the design of a successful shield. If that be conceded, he thinks that one large tunnel would not be dearer in first cost than two smaller and independent tunnels, while in other respects it has great advantages. He considers that any

* It has been pointed out in the course of the discussion that the further extremity of the City and Southwark Subway has been constructed at Stockwell through water and gravel, the pneumatic shield being used.

roadway of the length of the tunnel and its approaches, which is only wide enough for two lines of heavy traffic, will not be satisfactory, and that provision should be made for one line of passing traffic in addition to two lines of slow traffic. All things considered, he recommends under the second head a tunnel circular in cross section, with an internal diameter of 31 ft. This would provide a roadway 22 ft. wide between the kerbs, with a headway of 15 ft. over the whole roadway, being a space of 2 ft. 3 in. on each side between the wheels and the kerbs for carters and others, and to prevent the walls from being touched by loads. The foot traffic could be accommodated in an upper gallery suspended from the roof, and would have a width of 12 ft., with a height of 8 ft. in the centre, and there would be space on either side of the roadway for ventilating purposes, and for pipes, telegraph cables, &c. An alternative to this arrangement would be a tunnel also circular in cross section, and of the same size as the one last described, but with a gallery below the roadway for foot-passengers.

On the third head of the reference to him, Mr. Wolfe Barry reports that he is inclined to think that there might be an advantage in drawing the specification in the alternative way, so as to provide for two prices, as suggested.

Lastly, under the head "generally," Mr. Wolfe Barry discusses, as alternatives to the proposed tunnel, a steam-ferry and a high-level bridge. He thinks that possibly a really good and convenient free ferry, which would cost a small sum compared with a tunnel or bridge, might sufficiently accommodate the traffic for some years. A tunnel or bridge must of necessity occupy some years in construction; a ferry could, however, be set to work quickly in the meantime, and while the larger work was being matured and executed it would guide the Council as to the proper amount of accommodation to be provided, and as to the capital which could with propriety be expended on a tunnel or bridge. Any proposal for a high-level bridge would, he considers, involve raising the traffic by hydraulic lifts. There would, however, Mr. Wolfe Barry says, be no difficulty in so arranging these lifts that no delay would occur. On the whole, he sums up in favour of a high-level bridge rather than a tunnel.

The consideration of the subject is now before the Council, the greater part of two sittings having been already devoted to it. As we reported in the *Builder* for the 1st inst., the Bridges Committee, having considered Mr. Wolfe Barry's report, recommended—

"That the Council do proceed with the formation of the tunnel authorised by the Thames Tunnel (Blackwall) Act, 1887.

"That the Bridges Committee be authorised to nominate an engineer of experience in tunnelling with a pneumatic shield, to prepare the necessary plans and specifications for carrying out the works, submitting the whole to the Council."

To these recommendations Mr. Arthur Arnold moved an amendment as follows:—

"That the Council doth disagree with the recommendations of the Committee, and is of opinion that the report of Mr. Barry should be adopted so far as it is opposed to the construction of a tunnel at Blackwall, and that the best efforts of the Council should be directed to providing such other means of communication as may appear most desirable."

So far as the debate on the subject has yet proceeded, opinions seem to be pretty evenly divided between tunnel and ferry, while the idea of a high-level bridge seems to be generally regarded as inadmissible. But we do not quite gather from the latest report of the Bridges Committee, published by us a fortnight ago, nor from the speech of the Chairman of the Committee, in moving that report, whether the Committee are in favour of three tunnels, as proposed by Sir Joseph Bazalgette, or one tunnel to accommodate all traffic, as proposed by Mr. Wolfe Barry. It seems now to be the intention of the Bridges Committee to leave this an open question until the "engineer of experience in tunnelling with a pneumatic shield" whom they propose to appoint to prepare the working drawings and specifications advises them as to the best course to pursue. In their report as first presented to the Council on February 11 (see *Builder*, February 15, p. 119) they recommended

"That the Council do proceed with the formation of the tunnel authorised by the Thames Tunnel (Blackwall) Act, 1887,—*namely, by three lines of borings, one being for foot passengers and the other two for vehicular traffic.*"

It will be noticed that in their recommendation now before the Council the Committee have deleted the words which we have here put in italics.

Mr. Walter Hunter, J.P., who is himself an engineer and a member of the County Council, has issued a pamphlet commenting on Mr. Wolfe Barry's report. He is strongly in favour of the construction of the tunnel, and cites the opinions of Sir Frederick Bramwell, Sir Benjamin Baker, Mr. Henry Law, and other eminent engineers, as to the perfect practicability of the work. He also appends a letter from M. Coiseau, of Antwerp, who constructed the foundations of the Forth Bridge, and who has also constructed works under the Scheldt. M. Coiseau is so confident as to the practicability of executing the tunnel by the compressed air method that he last year, in conjunction with Mr. Webster, submitted a tender for the construction of one of the tunnels. Mr. Hunter and the other supporters of the tunnel project urge that if a communication is to be made across the Thames at Blackwall, it must be of a permanent and non-intermittent character, and must not interfere with the shipping. The tunnel scheme, they contend, is the only one which fulfils all these conditions. A ferry at this point, they urge, would be liable to interruption for days together by fog,* and would be at all times a serious danger and hindrance to the ships constantly passing in and out of the East India Docks.

On the other hand, the advocates of a ferry, among whom is Mr. J. G. Rhodes, point with some force to the success of the Woolwich Ferry, and lay great stress upon the uncertainty of the cost of the tunnel. They contend that, all things considered, the ferry will be amply sufficient to accommodate the traffic. The first cost of a ferry will, of course, be much less than that of a tunnel, but the yearly cost of working and maintenance will probably be as great or greater than the yearly cost of maintaining the tunnel—including, of course, interest on capital sunk.

A great many able speeches have been delivered on both sides, and the debate was to be resumed on Friday afternoon, March 14.

* In regard to this point, we may observe that the ferry traffic between Liverpool and Birkenhead, across a much wider river, is never allowed to be interrupted by fog, though of course the transit is slower.

A FEW NOTES CONCERNING ANCIENT SEDILIA, PISCINÆ, AND AUMBRYS.

ANCIENT sedilia are generally found on the south side of the chancel. These seats for the officiating clergy are most frequently recessed into the wall, and present a beautiful variety of treatment, some of them having rich canopies over them ornamented with crockets and finials. In most instances they are not more than three in number, though there are sometimes four or five of them, and occasionally only one or two. Most frequently they graduate in height eastwards; but are also to be found on the same level, especially when there are only two, as at Wolvey, in Leicestershire. Occasionally the sill of the south-eastern window forms the sedilia, as in St. Martin's Church, Brasted, in Kent. In some instances they are made to represent stone chairs, as in St. Michael's Church, Spennithorne, in Yorkshire, where the seat is wide enough for two priests, and there is a lower bench for another. These stone chairs are made with or without arms, and they are always placed in the position usually occupied by recessed seats, and we may be sure that when there are no traces of either sedilia or stone seats for the officiating clergy, there must once have been substitutes made of wood.

There is a single simple sedile in the south chancel wall of Chalk Church, in Kent. Adjoining it is the piscina. Both have trefoiled headings, whereof the two outer labels, which follow the same contour, are finished with rosettes, and the central terminal, which serves for both, takes the form of a mask. The piscina has a shelf, and the drain is in the centre of a scooped bracket which projects from the wall, and is supported on the head of a cherub. There is a single one, too, at St. Mary's, Dennington, Suffolk. In Maidstone Church the sedilia are quintupled.

In some of the ruins of ecclesiastical buildings that form such picturesque additions to many of our loveliest landscapes, we come upon sedilia open to the sky, of course, and fringed with ivy and other creeping plants; and set as they are in a background composed of the rest of the remains, consummate arches, pillars, traceried windows, and reticent doorways, they hold their own in the matter of interest. There is a ruined priory church standing on a knoll on the banks of the Aine, in Northumberland. Close by, on the other side of the river, is a mount, said to resemble Mount Carmel, though it is all heather, bracken, boulders, mosses, and ferns up to its breezy summit. There is a wide, strong, mellow curtain wall, with projecting turrets at the angles running round the place of table-land on the head of this knoll, and within this enclosure lies the ruined priory. There is a strong tower in it, built by one of the ancient Percies for its protection, that is still whole and sound, even to its topmost stage, in which is a charming oriel looking over to the Carmel-like mount across the river; but the monastery buildings are bare to the great canopy that covers all things. And crossing the grassy floors, in which is a dark, sunken tomb-slab here and there, we come upon the graceful sedilia, empty, silent, and windworn, but truly an exquisite and pathetic memorial.

These features are to be found in most counties. They are to be seen in the northern district that William the Conqueror gave to Robert de Umfraville, on condition that he would keep it free from wolves and thieves, in Elsdon Church, where, on the floor, may yet be seen the tomb-slabs of the knightly successors of the valorous Robert aforesaid. They are to be seen down in the Devonshire valleys, in several Cheshire churches, in Cambridgeshire, Buckinghamshire, Huntingdonshire, Gloucestershire, Bedfordshire, and, in short, in most counties, east and west. In Lincolnshire, especially, there are sedilia of the finest workmanship in nearly every church. Cornwall, however, appears to have disregarded them, and to have but few piscinæ. In different parts of the kingdom there are about half-a-dozen examples of a larger and plainer recess on the western side of the sedilia which may have been the bare bases of seats, or thrones, used only in grand ceremonials, when they may have been decorated for the occasions for which they were intended. In the church of St. Mary, Great Sampford, in Essex, besides three sedilia in the usual place, there are eleven stone seats on each side of the chancel.

There are a few ancient churches in which we do not find a piscina, or more than one. It was a necessary appendage to the altar in old times, and those churches that had more than one altar were furnished with more than one piscina. It has been noticed they were frequently double till the thirteenth century, when an alteration was made in an item of the service that made single piscinæ the rule after that date. There is an example of a triple piscina in Holy Trinity Church, Rothwell, Northamptonshire. They were nearly always placed in the south wall of the chancel, or of the aisle in which an altar was provided. The exceptions to this rule are rare. One occurs, though, in Rochester Cathedral; and another in Ditchling Church, Sussex, where they may be seen on the north side.

The most general form of a piscina is that of a small low niche, or recess, in the wall, with a shallow, bowl-like base, in which is the orifice of the drain that carries off the water used in rinsing the chalice; though they sometimes project on brackets, and sometimes the drain runs down a shaft or column. Occasionally they are furnished with a shelf, which is supposed to have been used either as a credence table or as a place on which to place the cruet. The openings were finished according to the taste of the day, either plain or with columns and arches that were plain or foliated. Trefoiled piscinæ are, perhaps, the most common. There is one in a small Early English church at Lesbury, in Northumberland, where the tall, alert, narrow, lofty arches in the nave and small window-openings are testimonies to Plantagenet masons. In the chancel, opposite to an old tombstone embedded in the north wall setting forth the memory of a vicar who lived to be more than a hundred years old in the seventeenth century, is the trefoil opening in question. Cinq-foiled and sept-foiled piscinæ also occur, and where there is no foliation we may sometimes find the encompassing arch of an earlier workmanship, and decorated with ball-flower and other ornament.

There is a piscina in the east wall of the south aisle of Alnwick Church. From a lingering tradition, which calls the east window of this aisle the Mary window, we may conclude there was once an altar here dedicated to the Virgin.

The window is now filled with stained glass, as a memorial of Algernon, fourth Duke of Northumberland, and the altar has been removed; but the little piscina, which is close against the side of a low doorway giving access to stairs winding up to a beacon turret on the roof, remains. It projects from the wall in the form of an inverted cone, in front of a small ogee-headed recess, and on the north side of it is a small aumbry now blocked up. One of the ancient Percies, the third Earl, left various sums in his will to be divided among eight parish churches, of which Alnwick was one; and, among large sums for clergy and the poor, he left one hundred marks to twenty chaplains to celebrate certain services; and, seeing he was so just and chivalrously generous as to have left, also, 200*l.* to satisfy any one, in any part of England, at any time, who might complain he had been wronged by him or his people, it is a pleasure to dwell upon his memory, and to think that, perhaps, these relics were associated with the solemn celebrations he desired.

When the mean and modern chancel of Ambleton Church was taken down to be rebuilt, in 1866, a double piscina and fragments of windows and mouldings were found used up as wall-stones. There are many double piscinæ that have not been disturbed, as at Weston Turville, Whitchurch, and Milton Keynes in Buckinghamshire. There is an instance in All Saints' Church, Long Wittenham, in which is a small effigy of a knight, with angels above, who appear to be welcoming his spirit. In Padstow Church, Cornwall, the piscina has a small niche over it, containing the figure of St. Petrock in bas-relief, with a crutch-stick in one hand and a book in the other. At Milton, in Cambridgeshire, the piscina has a detached column ornamented with lilies; and in Barlow and Arrington Churches, in the same county, are double piscinæ under interlaced arches. In St. Aidan's Church, Bamborough, for all time to be associated with the memory of Grace Darling, who is buried in the wide churchyard without, there are two piscinæ, one in the north and the other in the south wall of the chancel. In Deal Church, Kent, there is a fine piscina of Norman workmanship. There is an example of ornamentation by means of heraldic devices in Newton Longueville Church, which is enriched with the arms of William of Wykeham.

Over and above the usual piscinæ some few churches have been provided with a small hole in the floor to the south of the altar, as at All Saints', Little Casterton, Rutland, and St. Botolph's, Hevingham, Norfolk. In ancient dedication services the water used for consecrating a church is ordered to be poured out at the foot of the altar, and these holes may have been made for the purpose of carrying it away conveniently.

An aumbry, or square recessed locker, seems to have been a very general provision made for the safe keeping of articles of value used in the services. They are to be noted in various positions, though the greater number will be found on the north walls of chancels, just as we most usually find the sedilia in the south wall of the same part of the fabric. The doors with which they were originally furnished have disappeared for the most part. We have, however, a few perfect examples still left to us, among which may be named those in All Saints' Church, Barrington, Cambridgeshire, and the church of St. Columba, Collingtree, Northamptonshire. There is one, too, in the little leaden-grey church at Llanbedr, Merionethshire. This is on the north side of the chancel, and bears on the door heraldic devices that probably indicate the lord of the manor at the time of its last embellishment, if not of its original formation. There is an instance in the church at Little Bytham, Lincolnshire, in which an aumbry is placed across an angle in the chancel; and in Sussex, in Pulborough Church, there is one in the middle of a window-sill. There is a double aumbry in the north aisle of St. Mary's Church, Long Sutton, as well as a single one in the south aisle. Here and there we find them blocked up as being of no further use, and destroying the uniformity of both sides of the chancel,—as was the case in the old Norman church at Shilbottle that was taken down before the present structure was erected.

There is a longer and narrower recess to be noticed in some very few ancient churches, generally to the north of the altar. It descends almost to the ground, and seems likely to have been made for the safe-keeping of a processional cross or staff too long to be kept in the aumbry. As indicated, these are few and far between.

Another variety of wall recess is not so easily accounted for. In Bothal Church, where there are stately arcades and aisles, two noble alabaster effigies on tombs, three cusped-headed sedilia, a piscina, an ancient door with the old strap-hinges upon it, and a low side window; there is in the north-east angle of the north aisle a curious recess cut with splays into the thickness of the two walls at their meeting point, for which it is difficult to assign any purpose, as it is too high up for an aumbry, and too irregular in form for a niche. There is a small square recess near the ground to the east of the piscinæ in two churches in Lincolnshire, the use of which is also unknown; and another in Morpeth Church, in the south aisle, on the ground level.

There is a very interesting Norman church on the south bank of the Coquet, at Warkworth, whereof only the south wall has been taken down. All the rest of the building is left intact, just as the toil-hardened hands of the Norman masons built it; just as they left the deep-set semi-circular-headed windows on the north side, all boldly splayed that as much light might come through them as was possible with their small external dimensions; just as they left the label-moulding running from one to the other, ascending over each window-head, and descending again to pass on in a straight, projecting, rounded stone line to the next; with the same ornamented ribs to the bays of the stone-vaulted chancel; and the same enriched lowly-curved chancel arch. In a subsequent century, after the Norman masons were forgotten, a strong tower was built against the west end, which enclosed the original doorway, with the small, round-headed west window above it, in its ground-story; and after the masons who built this tower were in their turn forgotten, and other masons had raised a spire upon it, and were forgotten too, and at least two centuries had sped, the south wall of the nave was taken down, and a row of resolute-looking columns placed on its site; from which was thrown out a wide light aisle, with vast mullioned and traceried windows in it; which makes this side of the edifice bright and airy, though it leaves the Norman chancel as dim and solemn as it was first made. In this dim, ancient, groined sanctuary are three aumbrys, two on the south side and one on the north; and in the radiant aisle is a piscina, and a second small recess that may have been another made out of Norman fragments taken down. On the south side of the chancel arch, in the nave, is a bracket, high up, as though meant to hold a statuette, or perhaps a taper, and on the north side is a recess for a statue; and everywhere, from porch and parvise to the ashy-grey square-shapen timbers of the aisle roof, is an air of reverence and simplicity that is as an assurance of the piety and right endeavours of those who have had the charge of the edifice in the sequence of the centuries, through all the processes and stages of progress that have occurred.

Chaucer, in the Parson's tale, says:—"Certes the swerde thatt men geuen firste to a knight, whanne he is newe dubbed, signifieth that he sholde defende holy churche and not robbe it ne pile it." Some such feeling has, doubtless, prevented the removal of many of these interesting old features in our ancient churches. They are tokens of old phases of piety, and as memorials they should be preserved with care.

Cromer.—A new hotel, on a splendid site on the Cromer estate of Mr. B. Bond Cabbell, commanding a fine uninterrupted view of the German Ocean, is about to be erected to meet the urgent demands for such a building. The hotel will contain a large dining-hall and drawing-room, also reading, writing, smoking, and billiard rooms on the ground-floor, all facing the sea, besides eight private sitting-rooms and upwards of sixty bedrooms, the greater part having a sea-view. A passenger lift will be provided to all the floors. There will be the usual kitchen, office, and other accommodation. A tennis-court will be laid out and good stabling provided in the hotel grounds. Building operations commence at once by Messrs. J. Youngs & Son, contractors, of Norwich. The plans are prepared by Mr. George J. Skipper, of Norwich. The hotel is expected to be finished in the spring of next year, ready for the season.

SCULPTURE ON GREEK TEMPLES.—III.

MR. A. S. MURRAY'S third and concluding lecture of the present course was delivered on the 24th ult.* In this lecture he dealt with the sculpture of metopes and friezes. He commenced by pointing out that a Greek temple of the normal kind had both a frieze and metopes sculptured in relief. On the Parthenon, taking it as an example, the sculptured frieze ran along the top of the *cella* wall: the metopes, in high relief, occurred, at regular intervals, above the columns. But there were many exceptions to that normal arrangement, and among the exceptions perhaps there was none so interesting as the small Doric temple at Assos, in the Troad, which was unique in respect of the fact that it showed us both metopes and frieze, the one immediately above the other, on the external face of the building. This was the oldest Greek temple of which we had remains, and apparently, at the time when it was erected, the artistic taste had not yet ascertained by experience the limits of what was desirable, and what not, in the decoration of public buildings. The metopes were in their right place, but the frieze below them was sculptured on the epistyle directly above the columns, where, in after-times, it was usually thought necessary to present as great an appearance of solid strength as possible. The great blocks of the epistyle, extending from capital to capital, when left perfectly free, conveyed a true impression of their strength, and seemed quite adequate to their function; but when enriched with sculpture they necessarily lost that effect, and became a mere background for the reliefs. It was, therefore, a mistake, from that point of view, to sculpture the epistyle at Assos. As a matter of taste it was, again,—judged by the taste of later ages,—a mistake to bring those two sets of sculptures in such close relations to each other. The sculptures of the temple at Assos became known to the modern world in 1838, when the French removed a number of the reliefs to the Louvre, where they might now be seen. In 1881 the Americans explored the site of Assos very carefully, and found a number more of the sculptures, which were now partly in Boston and partly in Constantinople. Thanks to the American excavations, we were now not only fully informed as to the architectural character of the temple and the position of the sculptures on it, but we had also a large increase to the sculptures themselves, and were, therefore, better able to judge of them in relation to the rest of archaic Greek art. The first thing that was remarkable in these sculptures was the curious combination of human and animal forms. We saw wild boars, lions, and bulls; then half-human beings, such as sphinxes and centaurs; and, lastly, human figures, representing incidents in the legend of Herakles. To find a similar combination of animal and human forms in early Greek art, we had to turn to a class of painted vases which used to be called, and might still rightly be called, Græco-Oriental,—vases on which the designs had a mixture of pure Greek spirit in the legendary heroes on them, and of Oriental influence in the lions, winged sphinxes, bulls, and boars. Applying the knowledge obtained from these painted vases to the sculptures of Assos, the lecturer said we might fairly conclude that the sculptor had lived contemporaneously with the painters of the later class of those vases, or, in other words, about 600 B.C. Working at Assos, on the coast of Asia Minor, and possibly a native of the district, he would be more directly in contact with the artistic influence of Assyria than a sculptor in Greece proper, and that might be urged to account for his choice of subjects; but it did not explain so fully as we could wish the singular phenomenon of a sculptor engaged on an important public building turning for his designs to the same source as the humble painter of a vase. No doubt in later Greek art of the best period instances could be found in which sculptors and vase-painters showed us the same subjects similarly composed; but these were exceptional, for, as a rule, the two classes of artists worked widely apart. In the older archaic times it was different: there was then a greater community among artists and skilled workmen. The oldest sculpture we knew of in Greece was the relief of two lions above the gateway of Mycenæ. The oldest engraved gems we possessed had, first, figures of animals, and next, a combination of animal and human

* For reports of the second and third lectures see *Builder*, pp. 155, 172.

forms. One of the most interesting of these archaic gems was one in the British Museum, which represented the conflict of Herakles and Nereus as it was to be seen on the frieze of Assos. The gem was no doubt rude in comparison with the frieze, and possibly was a good deal older; but the conception was the same, and we might fairly argue that both gem and frieze belonged to an artistic period or movement in which the Greek genius, with its true love of human form and heroic legend, was beginning to assert its supremacy over the influence of the East, to which it had owed its first instruction. During such a movement we could easily conceive that artists employed on public monuments or temples would not stand on their dignity as superior to the engravers of gems or the painters of vases; a common bond would unite them all. Indeed, we knew from actual tradition that the greatest of the early sculptors, Theodoros, was at the same time a gem-engraver. He also was a native of Asia Minor, and possibly was a contemporary of the sculptor of Assos. Both the frieze and the metopes of Assos were sculptured in low relief, and were, so far, true to the archaic influence of Assyria, with its vast array of sculptures in low relief. For the frieze that was necessary, but it seemed curious to us now, with our knowledge of later Greek art, to find that the height of the relief was not increased in the metopes. Probably it was thought that as the metopes were so close to the frieze, any noticeable change would have produced an inharmonious effect. But more likely it was force of artistic tradition that determined the point. In any case, it was well for the early sculptors of Greece to keep to the known methods of low relief until they felt themselves to be sufficiently masters of the technicalities of their art. The legendary subjects on the frieze referred to the exploits of the national Greek hero Herakles. Having described these subjects in detail, the lecturer concluded his reference to the temple of Assos by saying that it was a temple in which metopes and frieze were curiously associated together, as if in one of those experiments which were inevitable in early times of art and architecture. In point of date we had not far to go to find another interesting exception to the general rule previously mentioned, though in point of distance we had to pass from the coast of Asia Minor, in the East, to the Island of Sicily, in the West. In Sicily the town of Selinus had been founded by Greek colonists. It lasted a comparatively short period, but during that period it had raised three temples, the ruins of which had survived to our times. Of these temples it was the oldest that interested us most now, because of the fact that its only sculptured decorations consisted of metopes. The pediments were empty, and it had no frieze. Very probably this was no more than incompleteness. The original intention might have been to fill the pediments at least, if not also to sculpture the frieze. Pressure in other directions might have delayed the work until the destruction of the town by the Carthagenians made an end of all hopes. Of the metopes of the temple, three were found nearly complete, and they are now in the museum at Palermo. They were found by two Englishmen, and, through their good offices, casts of them were obtained for the British Museum. The subject of one of them was Perseus, backed by Athene, cutting off the head of the Gorgon Medusa. From a technical point of view these metopes of Selinus suggested a comparison with the reliefs of Assos, but while the latter were sculptured in low flat relief, the metopes of Selinus were in one sense in very high relief, and yet in another sense in very low relief: in other words, they stood out far from the background, but were not modelled with a full roundness reaching down to the background. On the contrary, they were modelled only on the surface, and it was kept flat. Wherever masses of shadow fell on the background it had merely the effect of blackness, and had little or no relation to the actual forms of the figures. In the metope of Perseus and Medusa there was very little background seen, and no doubt the desire of the sculptor throughout was to cover his space with his design, although that was not always possible. Proceeding to speak of the metopes of the Parthenon, the lecturer said there were ninety-two of them. A considerable number still remained on the building in their original places, but most of them had suffered severely from weather and other causes,—so much so that often the very subject which they were intended to represent could not be made out. Others were destroyed in the course of the Venetian bombardment in the seventeenth century. Those that were best preserved in the early part of the present century were removed by Lord Elgin to the British Museum. There was a difference in style among these. Some of them reminded us in some measure of the metopes of Selinus, inasmuch as the relief, though it projected well from the background, was yet made to present, as far as possible, a flat surface to the front. There was an avoidance of strongly-rounded forms wherever it was possible to avoid or to minimise them. For instance, the drapery which fell between the Centaur and the Lapith, who was sunk on his knees, might easily have been left out or forced back; but it was allowed to fill in the space, and thus to help out the desire of the sculptor to obtain as great as possible an extent of flat surface to the front. It was a mode of treatment which would be natural in the frieze of the Parthenon, which was kept throughout in very flat relief. In the other variety of metope from the Parthenon, the sculptor had aimed at an opposite effect. He had sought the utmost degree of roundness and projection. Having referred to the presence in certain of the metopes of the Temple of Zeus at Olympia, of small drilled holes in places where the sculpture projects most, the use of which he was unable to conjecture (nor could he endorse Prof. Petersen's view that the holes had been made to contain sharp metal spikes to protect the sculptures from the birds), the lecturer described the metopes and friezes of the Theseion at Athens, and, in his concluding remarks, said: "Pheidias and his contemporaries were able to startle the Greeks by the splendour of their conceptions and the magnificence of their ideas. Would that their works could startle us, and, making us forget the limitations of time and tradition under which they necessarily laboured, force us always to remember that the sculptures they have left us are an inheritance no less worthy of admiration than the great literature of Greek poetry and prose which has descended to our time, and in descending has had more to do in the fashioning of public spirit and character than almost any other element in our natures."

COMPETITIONS.

Asylum Buildings, near Dorchester.—The competition for additional asylum buildings at Charminster, near Dorchester, which was advertised last November by the Asylums Committee of the Dorset County Council, has resulted in sixteen sets of designs being sent in. Mr. C. H. Howell, the Consulting Architect of the Lunacy Commissioners, was appointed the assessor, and awarded the first premium to Mr. George T. Hine, of Nottingham, and the second to Messrs. Giles & Gough, of London. The Committee have confirmed the award of the assessor, and commissioned Mr. Hine to carry out the work. The present asylum accommodates 320 patients, and the new buildings will give accommodation for 400 more, together with a new administrative department, a large recreation hall, a detached church in the grounds, new laundry buildings, and various alterations to the old asylum. The total cost is estimated at from 40,000*l.* to 50,000*l.* Mr. Hine is the architect for the new asylum now being erected at Claybury, in Essex, for the London County Council, of which a view and plans were published in the *Builder* for Nov. 23 last.

Grant Monument, New York.—The result of "the international competition for a monument in honour of General Grant" has at last been published, after the designs have been in the hands of the promoters rather longer than seemed reasonable. Although the jury do not consider any of the competitors' designs suitable for erection, five prizes have been distributed. Of these the first has fallen to Messrs. Cluss & Schulze, of Washington; the second to T. Ph. Rinn, of Boston; the third to Messrs. Hartel & Neckelmann, of Leipsig; and the fourth and fifth to Herr Schweinfurth, of Boston, and Mr. H. A. Gribble, of London, respectively. We see that German members of the profession have taken the honours of the first, third, and fourth prizes.

Proposed Minister's House, Borough Synagogue, S.E.—A considerable number of drawings were received in this competition. The Committee called in a professional assessor to assist them in coming to a decision. Acting on his advice the design submitted by Mr. Sidney G. Goss, A.R.I.B.A., of London, was adopted. Mr. Goss has been instructed to prepare the necessary working drawings and obtain tenders for the work as soon as possible.

Illustrations.

THE NEW LESSING THEATRE AT BERLIN.

THE new Lessing Theatre, the private property of Dr. O. Blumenthal, was completed in September, 1888, having taken barely a year to erect. Eleven hundred seats have been planned in the building, and standing-room for some sixty people has been arranged for. Of the 1,100 seats, 128 have been placed in the orchestra and side boxes of the perquet, and room has been found for 430 on the main floor of the house. The 542 seats remaining have been placed on two tiers, 214 on the first, and 328 on the second; and the standing-room has been partly allowed for in the pit, partly also in the second tier, the back places of which are priced the lowest.

The structure is almost entirely of a fireproof nature, wood having only been used for the stage flooring, the box partitions, and the lathing of the cupola. Most of the floors are vaulted in, the few exceptions being constructed in sheet iron. All the staircases are of freestone and have very easy ascents. On the proscenium side of the building four staircases have been planned, two for each tier, and each of these has not only the advantage of being in close connexion with the chief lobby, but at the same time the far greater one of leading directly into the open. The total width of the exit doors for the audience shows a figure of 14·50 mètres, hence giving one mètre exit width to eighty visitors. The main corridor running at the back of the boxes has a width of 4·30 mètres, and, besides the very sufficient room for refreshment and cloak-room purposes, a foyer with a superficial area of nearly 150 square mètres, and with its floor only 4·60 mètres above street level, has been planned, thus making a crush in case of a panic nearly impossible.

The stage measures 20 mètres by 18 mètres, and its opening towards the audience has a width of 9·80 mètres to a height of 7·50 mètres. This opening can be closed, within seven seconds, by an iron curtain, working on a very simple system. The large flue over the stage has a superficial area of 16 square mètres, or about $\frac{1}{19}$ of the stage floor. All scenic and technical apparatus is of the most modern date, and high-pressure hydrants command the whole of this part of the house.

The building, which has been designed by Messrs. v. der Hude and T. Hennicke (in conformity to the former building regulations), covers 2,300 square mètres of the site, and has cost the proprietors 1,018,000 marks, or nearly 50,900*l.*

DESIGN FOR SPIRE.

THIS design, by Mr. J. A. Pywell, was awarded a Medal of Merit in the Grissell Competition of the Royal Institute of British Architects, and is for a timber octagonal spire to be covered with lead and with angle-turrets at or near the base.

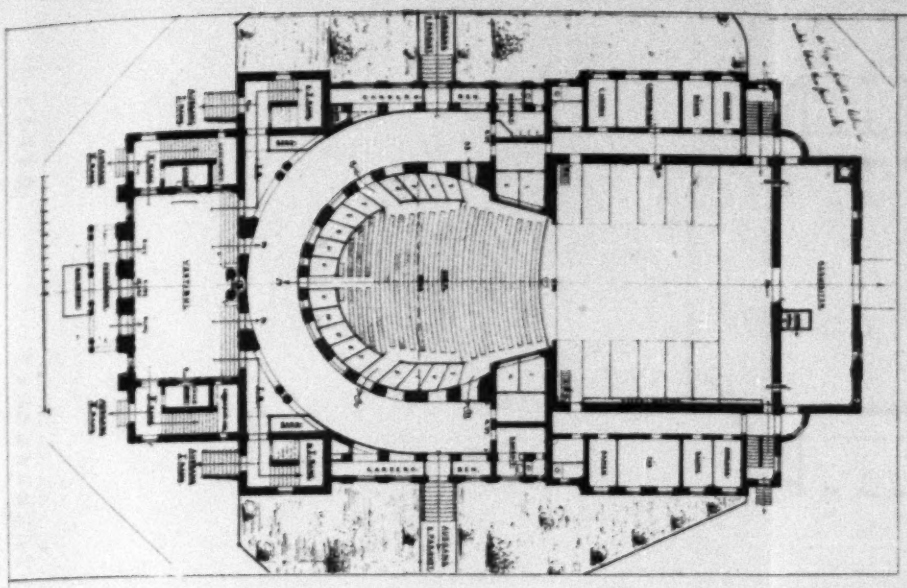
ENTRANCE GATE, MANOR HOUSE, COLD ASHTON.

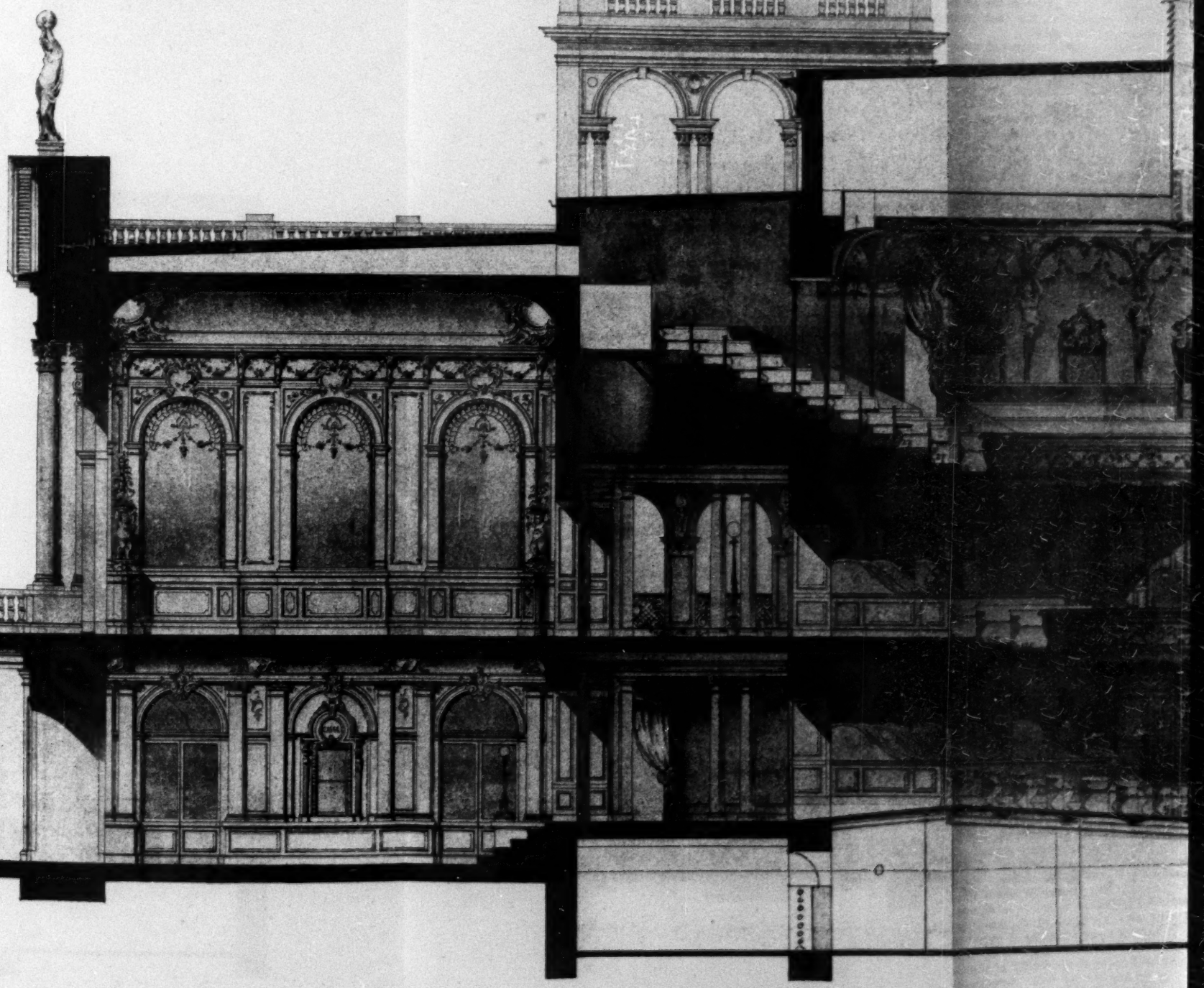
THIS gateway forms the entrance to the Manor House at Cold Ashton, or Cold Easton, so called from its exposed situation, and is of the early part of the seventeenth century. The house contains good screenwork and panelling of wood, and a rich plaster ceiling. There is no trace of the iron gates now save the hooks in the reveal of the arch, and some stonework is wanting over the arms, which, consisting of a lion's head and paws holding a shield with three guns on it, and surmounted by wings, were formerly those of the family of Gunning. The property now belongs to Mr. Gore-Langton.

The illustration is from measured drawings by Mr. M. Aston Green.

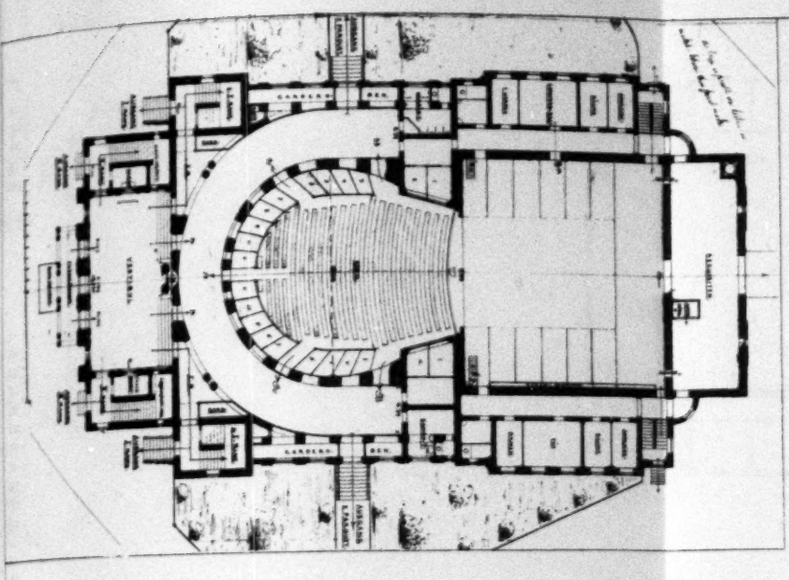
"SCATWELL," WARGRAVE.

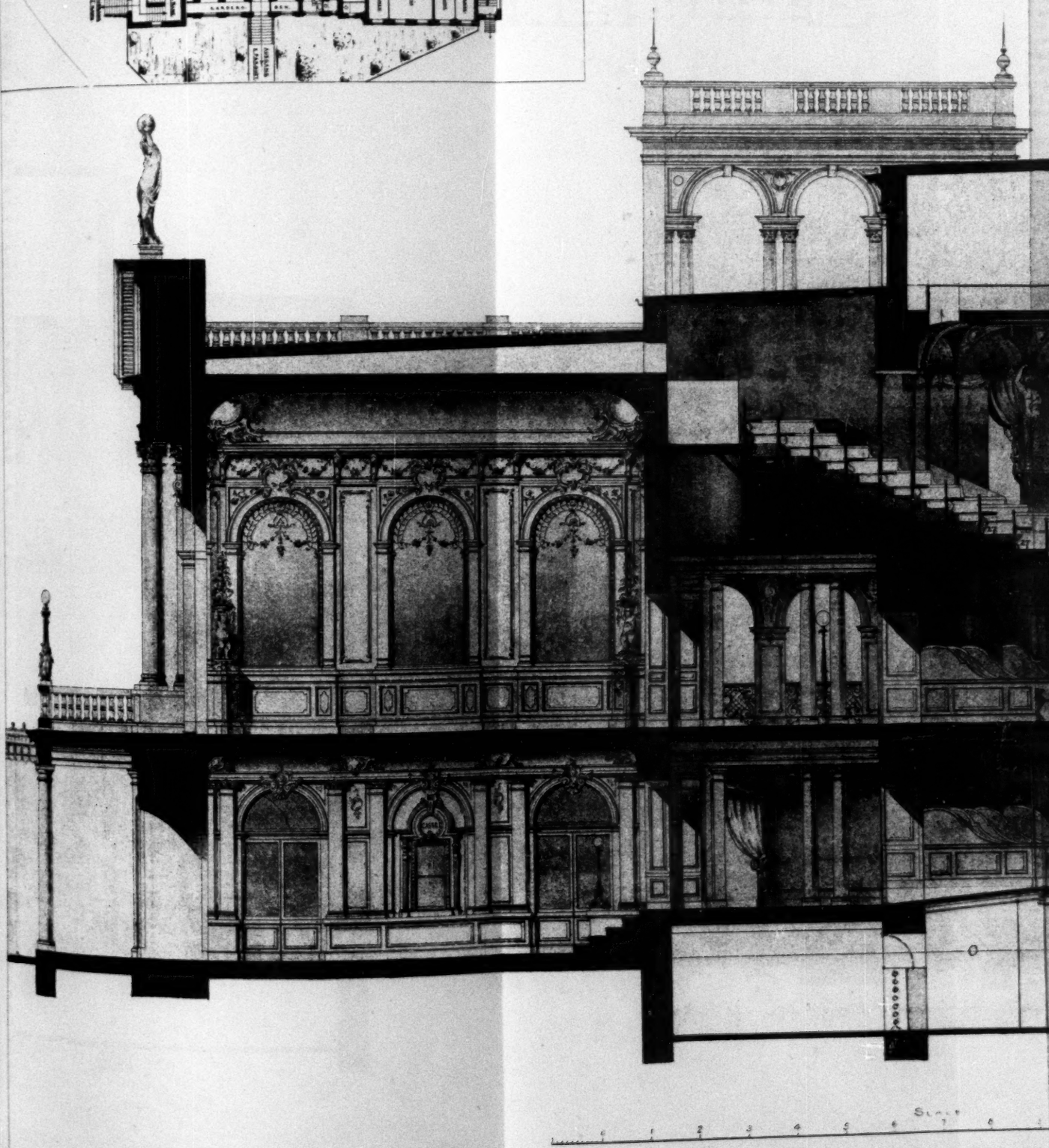
THIS is merely the rebuilding of a small property adjoining Sir Morell Mackenzie's house. It is used during the summer in connexion with the house by the owner and his family as a





THE NEW "LESSING" THEATRE, BERLIN.—Herren v. der Hude and Hennicke, Architects.
SECTION THROUGH VESTIBULE AND AUDITORIUM.





THE NEW "LESSING" THEATRE, BERLIN.—HERREN V. DE

SECTION THROUGH VESTIBULE AND A

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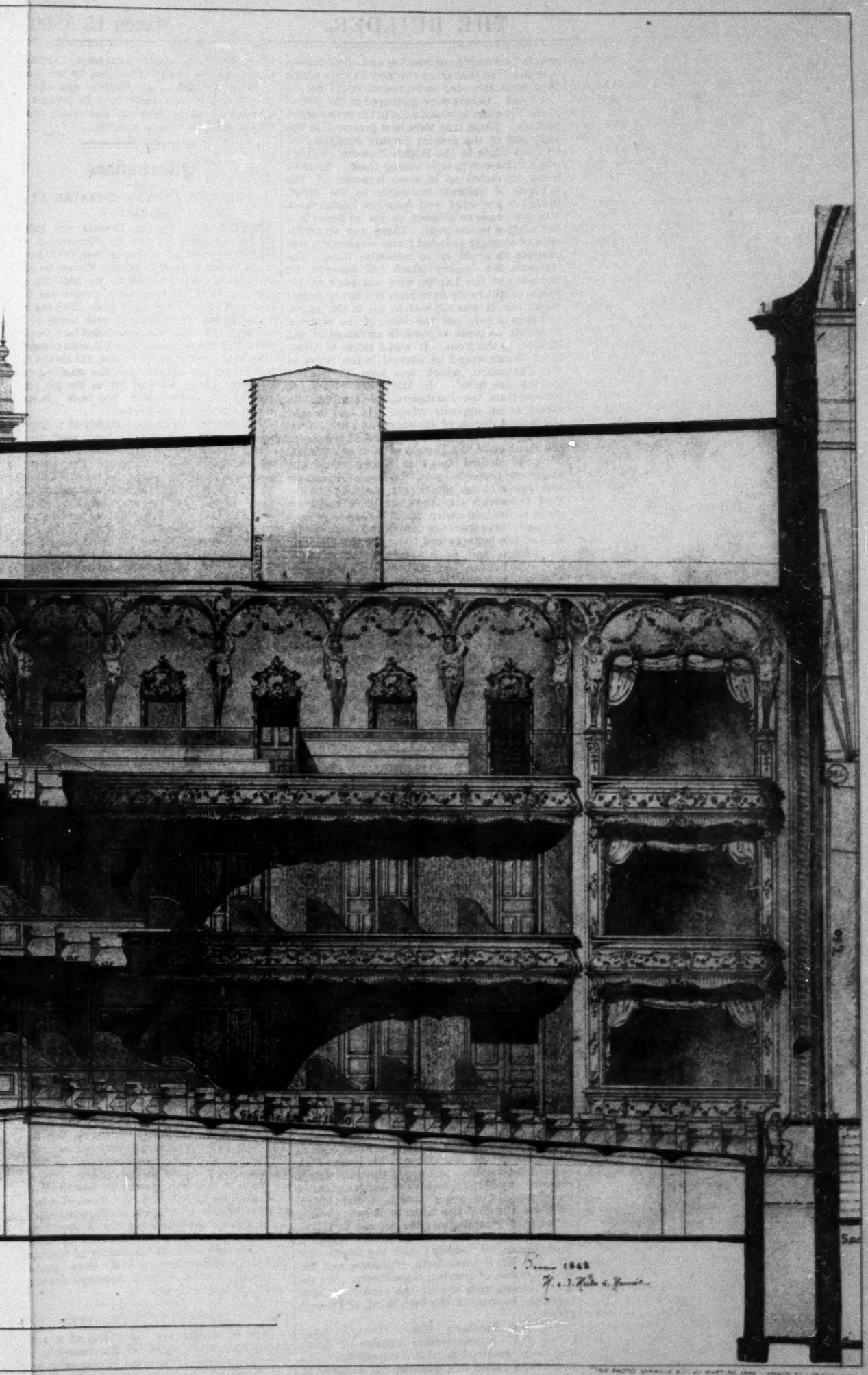

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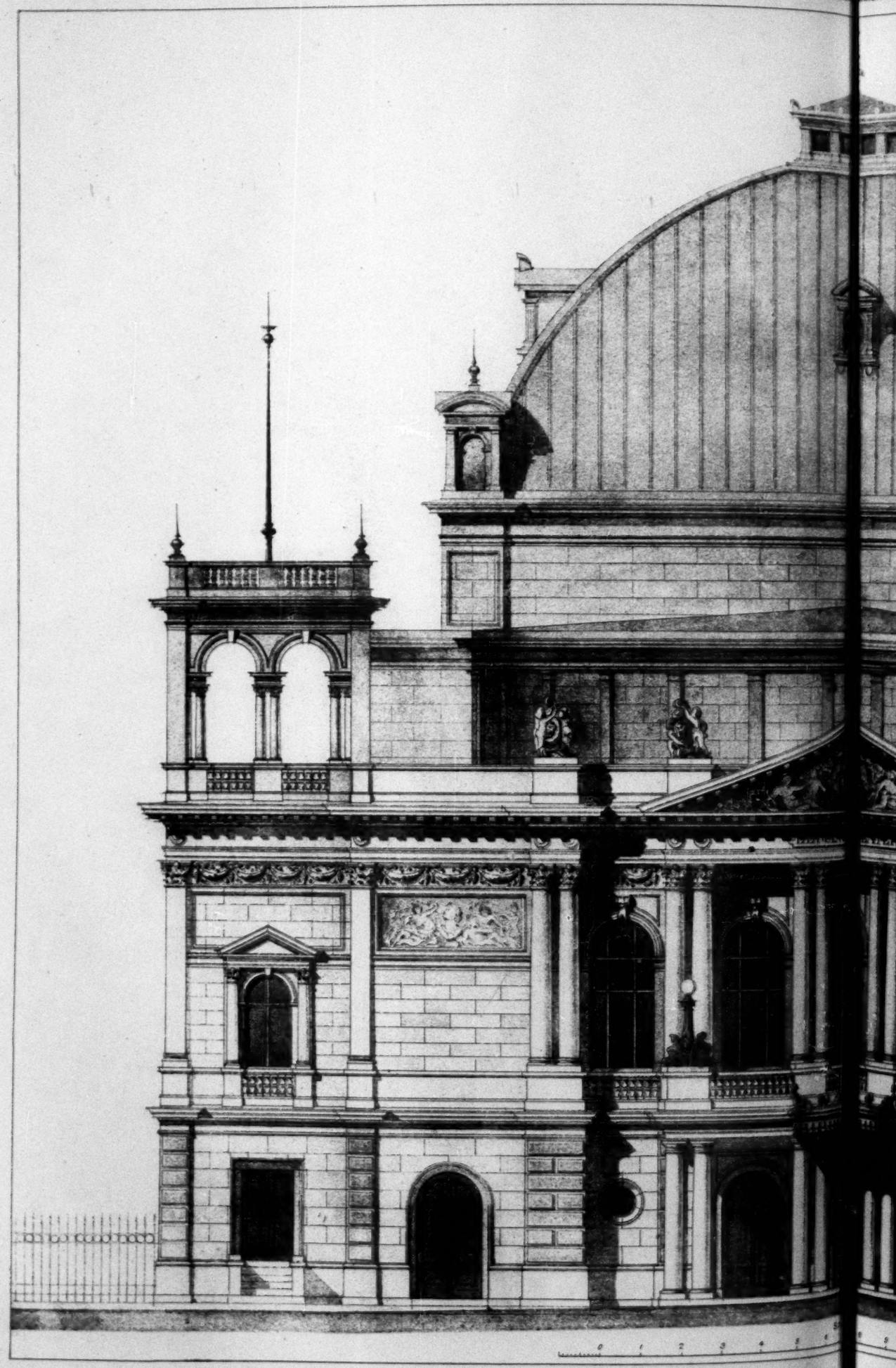
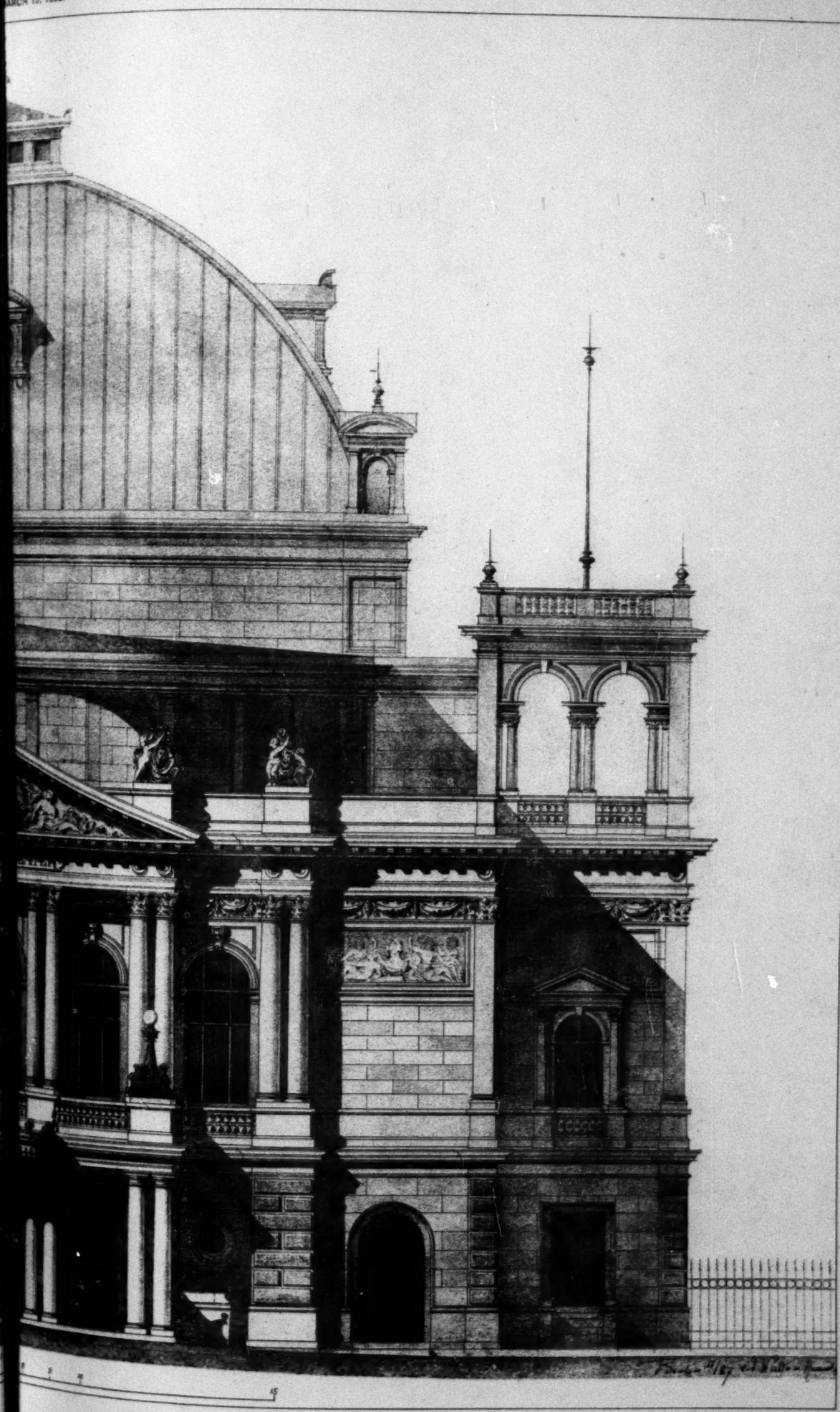


THE NEW "LESSING" THEATRE, BERLIN.—FRONT ELEVATION.



[Ink. PHOTO. SPRAGUE & Co 44 MARTINS LANE CANNON ST. LONDON E.C.]

W. DER HUDE AND HENNICKE, ARCHITECTS.

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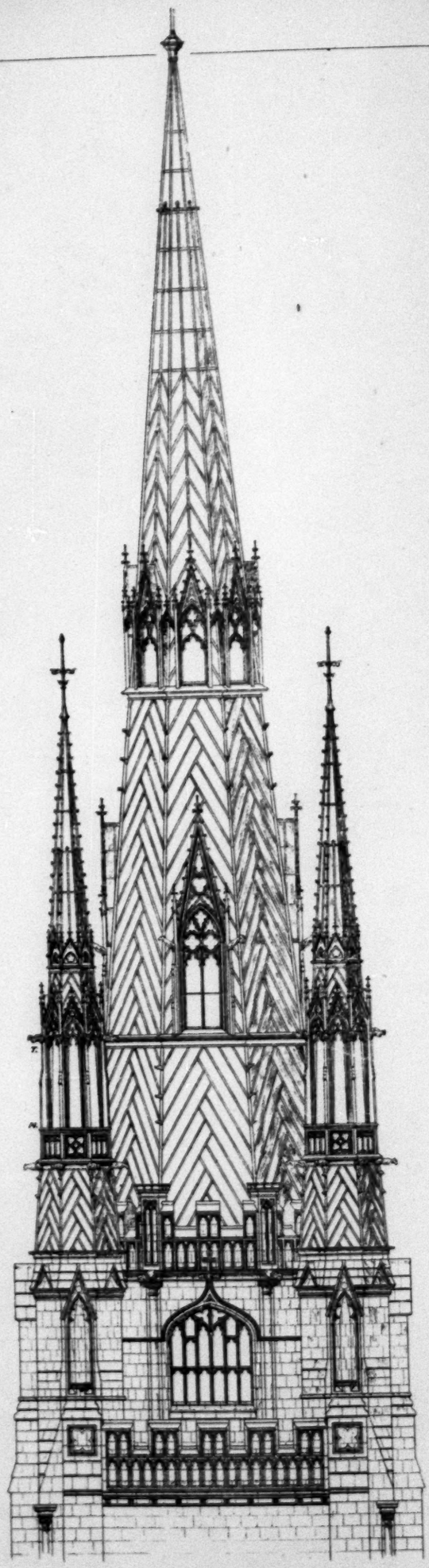
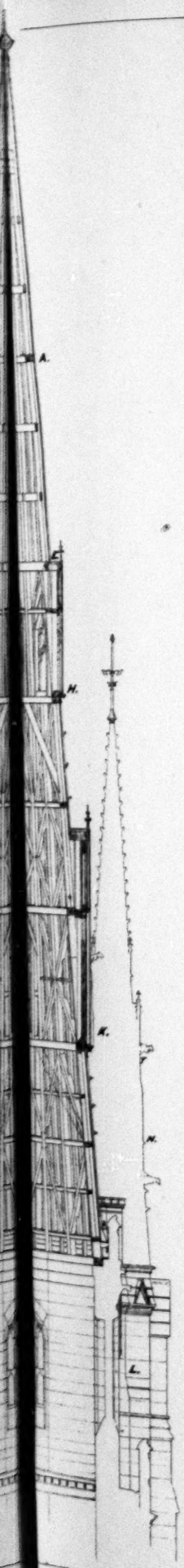


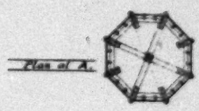
Medal of Merit: R.I.B.A., 1890.

GRISSELL Medal Competition.

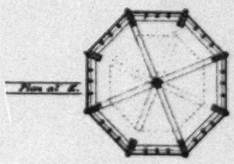
Design for a timber octagonal spire

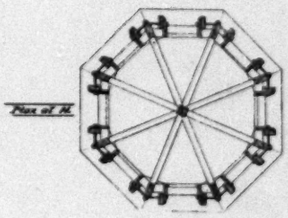
By Mr J. A. Pywell.

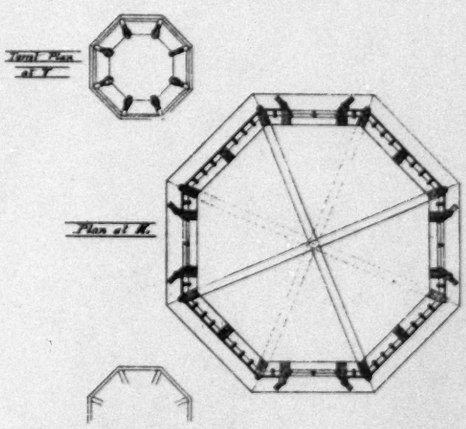




Transverse Section







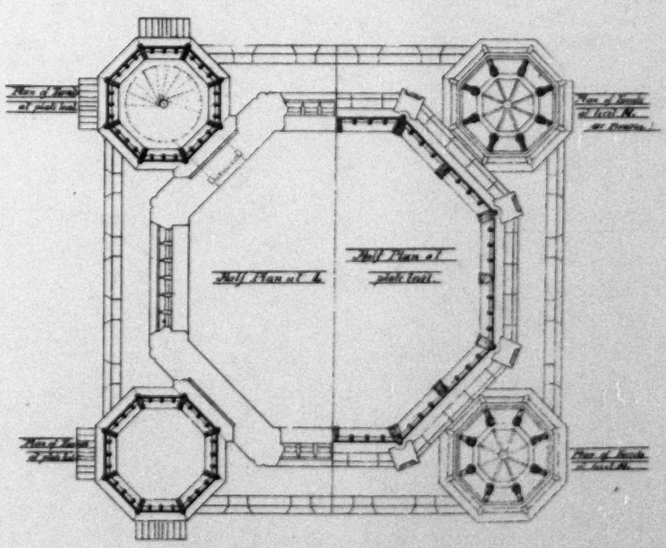
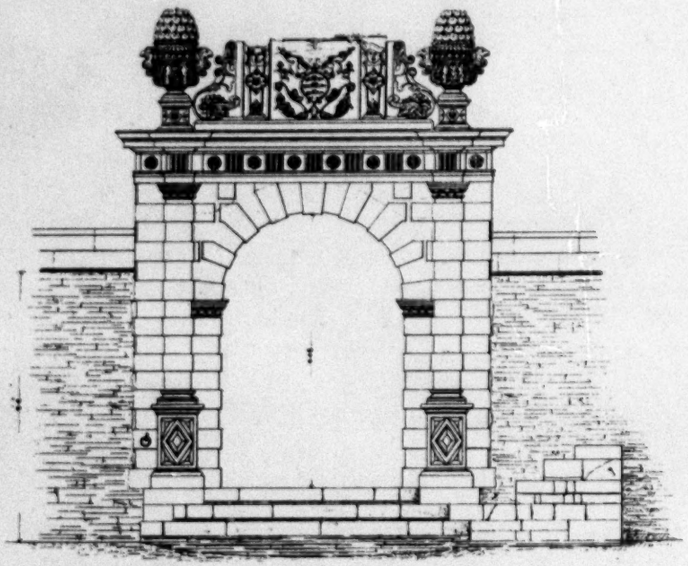
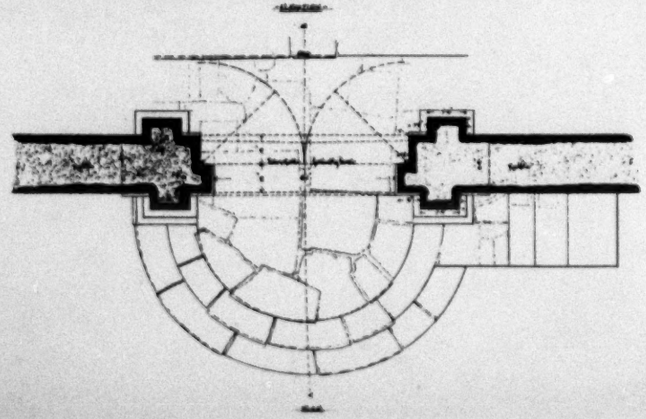
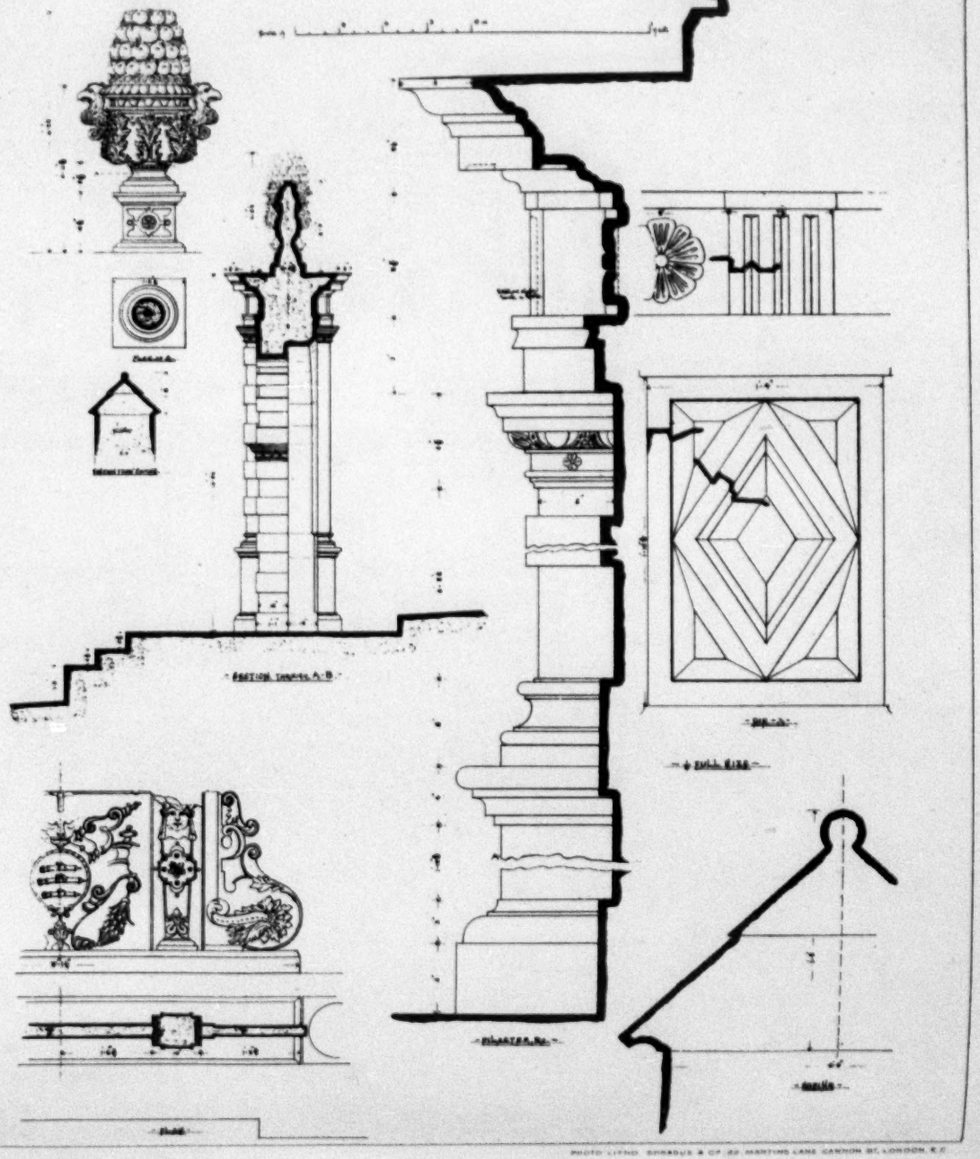


PHOTO-LITHO. SPRAGUE & Co. 52, MARTINS LANE, CANNON ST. LONDON, E.C.

ENTRANCE GATE, MANOR HOUSE,
CHILD ANCOTY, CHURCHSTRETTON.







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"SCATWELL," WARGRAVE.—Mr. Arthur Ardron, Architect.

riverside retreat, in the village of Wargrave, near Henley-on-Thames.

The work throughout is of a very simple character. The inside joinery is stained walnut and varnished; the exterior fronts are in red local bricks and red-tile hangings and timber work. The gables to the garden front are in rough cast work of fine Thames shingle, the front gable carved in cement.

The timbers are finished nearly black with Stockholm tar, and the roofs are covered with tiles.

Messrs. Silver & Sons, of Maidenhead, are the builders, and Mr. Arthur Ardron is the architect.

THE ARCHITECTURAL ASSOCIATION VISITS:

THE CHURCH OF THE HOLY TRINITY, CHELSEA.

THE Church of the Holy Trinity, Sloane-street, which is being erected from the designs of Mr. J. D. Sedding, and will shortly be completed, was visited on Saturday afternoon by a large party of members of the Architectural Association.

The plan of this church covers a rectangle, with a length of 150 ft., and comprises a nave 40 ft. 9 in. in width, with aisles 8 ft. 4 in. wide on each side. The north aisle is flanked by another and wider aisle, which will also serve as a Lady-chapel, and for this purpose is provided with a raised sanctuary adjoining the organ-chamber. A passage from the front of the building to the back is divided from the Lady-chapel by an arcade, over which light is admitted to the chapel by three windows in gables above. A deep gallery spans the west end, and is approached by circular stairs in the turrets.

On each side of the chancel minstrel galleries overlook the altar, which are reached by spiral iron staircases. The altar will be set forward 2 ft. and will screen a door communicating with the ambulatory behind, which extends across the chancel and is connected by doors with the side aisles and the vestries, occupying the north-east angle of the building.

Mr. Sedding, in the interesting description he gave of the building, called attention to the fact that the building was designed with a view to colour decoration of a somewhat elaborate description.

A deep frieze above the nave arcade will, it is hoped, be filled with paintings from the hand of Mr. Burne Jones, whilst it is proposed to place statues of the Apostles by Mr. Thornycroft in the niches prepared for them on the nave piers.

It is to be hoped that the addition of these decorations will tone down some of the baldness of the present appearance of some of the features, especially of those in the spandrils of the nave arcade.

It was stated that the east window is probably the largest in the United Kingdom, and that the main lines of the tracery of this and other windows were drawn in with a free hand and designed with a view to the later introduction of figures in stained glass. One of the aisle windows is perhaps one of the most satisfactory in its design. The clearstory windows by contrast appear to be very small.

It is to be regretted that the nave has been ceiled with a vault of wood, springing from stone shafts, and appearing to imitate a vault of stone. A more suitable design for the material might have been conceived, if a wooden roof was unavoidable.

The front elevation has been executed in red brick and Doulting stone dressings and bands, the spandrils to the entrance-doors being executed in rubbed brickwork, in preparation for carving.

The turrets, which flank the west window and the aisle-screens, with their gradually retreating faces, are certainly one of the most pleasing parts of the design.

The screens at first appear to terminate the side aisles, though in reality a much less projection would have been sufficient. The carrying of the battlemented parapet under the west window across the side screens, as an ornament and as a means of continuing the horizontal line, is open to criticism.

The building will be lighted by electricity, for the installation of which preparation is being made.

[We may add that we have published the following illustrations of this church,—viz., a double-page exterior view and an extra-large-size interior view on October 6, 1888; and a drawing of one bay of nave arcade on October 12, 1889.]

THE ASSOCIATION OF PUBLIC SANITARY INSPECTORS.

AT a general meeting of this Association held on the 1st inst. at Carpenters' Hall, Mr. H. Alexander presiding, a report was presented by the Council embodying its recommendations upon the question of the status of the Sanitary Inspector, which it had been instructed to consider. The Council came to the conclusion that in the various Acts of Parliament referring to the position and work of the Sanitary Inspector, there were five defects which it was desirable to remove in future legislation, and the report therefore recommended the Association to endeavour to secure the following amendments in sanitary law:—

1. That every candidate for the position of Sanitary Inspector shall have a general knowledge of the building trades, and, in addition, shall possess a certificate in Sanitary Science.

2. That Sanitary Inspectors shall have a permanent tenure of office, and shall only be dismissable for misconduct, or proved incompetence, with right of appeal to the Local Government Board.

3. That it shall be the duty of Sanitary Inspectors to periodically inspect the dwellings in the district to which they are appointed; and to receive complaints of nuisances and serve notices forthwith, requiring all necessary works to be done for the abatement of the nuisances. Such notices to be as valid, if confirmed by the Local Authority, as if served by the Authority's order.

4. That in all appointments requiring the officer's whole time to be given to the duties of his office, an adequate minimum salary shall be prescribed.

5. That the officers now variously named "Sanitary Inspectors" and "Inspectors of Nuisances" be designated "Sanitary Inspectors."

After a brief discussion, during which the Chairman announced that his Board (Shoreditch) had formally adopted proposition 3, the report was adopted unanimously.

Mr. Richards (Battersea) read a paper on "The Removal and Disposal of House Refuse in London." The practice of storing up refuse for weeks, instead of a very few days, before removal, was strongly condemned, and the manner of collecting and conveying it through the streets of London was described as "a disgrace to this centre of civilisation." The practice, formerly common, but, as the paper stated, "happily no longer permitted," of depositing it on proposed building-sites had been followed by the wasteful disposal of it either by deposits on the marsh-lands of the estuary of the Thames, or by "barging" it out to sea, and more recently, in some districts, by the still more wasteful process of "cremation." On the basis of the cost of machinery erected in Whitechapel for the latter method of wasting refuse, it was estimated that the enormous sum of 1,031,000*l.* would have to be got from the taxpayers of London, without counting the annual cost of working, on purpose to destroy annually 2,265,000 cubic yards of fertilising matter, a quantity sufficient to cover 1,400 acres of land with a layer of manure a foot thick. China, and recently Scotland, offered us examples of a more useful disposal of refuse, and in at least one London parish (Newington) these excellent examples had been followed, with good results. The larger question of the disposal of *all refuse* must, the lecturer declared, "ultimately receive the serious attention of the future Ministers of Health and of Agriculture. What must be more fully realised by our sanitary reformers is that the gradual diminution of the area under cultivation, and the decrease of the producing power of the land, not only means total dependence upon foreigners for our food-supply, but by withdrawing from the land those who should be employed upon it constitutes the primary cause of excessive overcrowding in our towns."

Mr. Poulson (Chelsea), in proposing the usual vote of thanks, condemned the method of storing the refuse preparatory to removal as a serious nuisance in Newington, and Mr. Grant, who seconded, said he thought cremation the only cure, opinions for and against those of the paper being expressed by other members in the course of the discussion.

THE LONDON COUNTY COUNCIL.

THE ordinary weekly meeting of this Council was held on Tuesday afternoon last, in the Council Chamber, Guildhall, Lord Rosebery in the chair.

Age of Retirement of Officers.—The Standing Committee presented the following report:—

"We are giving careful and anxious consideration to the important questions referred to us by the Council, relative to an insurance scheme for the servants of the Council, and also the establishment of a benevolent fund. These questions have been referred to a sub-committee, who have been making inquiries as to the course adopted by other Corporations and Institutions. In the course of their inquiry they have remarked upon the absence of any limit of age at which officials of the Council may be required to retire. The consequence of there being no provision for compulsory retirement may be that officers will remain in the service of the Council when they no longer have the vigour necessary for the efficient discharge of their duties. The Royal Commissioners on the Civil Service establishments have recently recommended that there should be compulsory retirement at the age of sixty-five years, and we are of opinion that it would be well for the Council to follow the same principle, and to fix sixty-five years as the age at which retirement should be compulsory. Cases may arise in which it would be advantageous to retain the services of particular officials, but this, we think, should only be done by a special resolution of the Council in each case. We recommend that the following be a Standing Order of the Council:—

'That every officer and servant of the Council shall retire at the age of sixty-five, unless the Council shall pass a special resolution to the effect that his retirement will cause inconvenience to the public service, in which case he shall continue for another year, and so on at the termination of each successive year of his age.'"

This was agreed to, after some discussion.

The Proposed Central London Railway.—The Parliamentary Committee presented the following report:—"On February 11 the Council passed a resolution that, in order to preserve the *locus standi* of the Council, to oppose, if so advised hereafter, on merits, a petition should be prepared against the preamble of the Central London Railway Bill. The report on Parliamentary schemes, prepared in the Engineer's Department, which has been circulated to the members of the Council, points out the serious interference of the proposed line with the Council's sewers, and it is evident that, in any case, proper protective clauses must be obtained. But, apart from this, as we have already pointed out in our report on the 11th instant, the question of motive power is one of very great importance. In the case of the similar scheme which was before Parliament last year, Sir John Fowler stated as follows, in evidence before the Select Committee on the Bill,—

'Those motors are liable to derangement, like anything else, and especially anything connected with electrical machinery. Electricity, so far from escaping difficulties as regards derangement, I think, according to everybody's experience at the present time, is rather liable to it; that is certainly my own personal experience.

'I quite grant you, if you like, this, that it has gone so far beyond the experimental stage that you are perfectly justified in adopting it; but we have not got so far beyond the experimental stage as to know how much liability there is to derangement of these motors.'

The petition of the Council, which was sealed on the 18th instant, and which was framed so as to enable the Council to oppose the preamble of the Bill, if considered advisable, contains the following allegations:—

'Your petitioners deny that any such public necessity can be shown to exist for the construction of the said subways or railway as proposed by the Bill, or that any such public advantage will result therefrom as will justify the public injury and inconvenience which the exercise of the said powers would cause, and your petitioners believe that no experience has yet been gained to show that the working of so large an undertaking, as proposed by the Bill, by means of electricity is convenient or practicable.

Your petitioners also call attention to the special provisions of the Bill as to interference with property by enabling the Company to acquire easements or rights of constructing and using their railway under certain properties, and also to the powers sought of interfering with properties by underpinning or otherwise strengthening the same, and your petitioners submit that such powers may cause injury and inconvenience. Your petitioners refer to the settlements and cracks in their sewers, caused by similar works, as showing that the risk of such injury and inconvenience is considerable.'

Owners of the freehold soil below that portion of the street which is vested in local bodies are petitioning against the Bill, and are

claiming compensation for interference with their rights; while, on the other hand, the interests of the authorities in whom the streets are vested are also affected. In the appeal case of the Wandsworth District Board of Works *v.* the United Telephone Company (Law Reports, Queen's Bench Division, vol. xiii., page 913), it was held by the Master of the Rolls that the property in a street passes to a certain depth, which depth is what may be called the 'area of user,' that is to say, such a depth as will enable the urban authority to do what is done in every street, to raise the street and lay down sewers. Now, we have the authority of the Engineer's report for the interference of the scheme with the Council's sewers, and we are informed that for a distance of three-quarters of a mile the line, as shown on the plans, passes within 25 ft. of the surface, and for two miles within 35 ft., there being, of course, a limit of deviation in either case, which might bring it considerably nearer. The case consequently appears to be within the limits laid down by the Master of the Rolls in the judgment above referred to. As regards the question of compensation, we desire to express the opinion that the local authorities, in whom the streets are vested, should be compensated in the same way as the freeholders of property on either side of the street. We are proceeding to obtain evidence in support of the allegations of the Council's petition, but looking to the terms of the resolution passed on the 11th inst., we are placed in a position of uncertainty, and we are anxious to have definite instructions as to the nature and extent of the proposed opposition. We, therefore, submit this report, and recommend:—

'That the opposition to the Central London Railway Bill be continued on the lines laid down in the Council's petition, and that the course taken by the Parliamentary Committee with regard to obtaining evidence be approved.'"

Mr. Beachcroft moved the following amendment:—"That as no resolution has been come to by the Council to oppose the Central London Railway Bill on its merits, and as the object of the Bill, if successfully attained, will effect a great metropolitan improvement without charge on the rates, the opposition of the Council to such Bill be confined to the taking of needful steps to secure the special clauses required to protect the sewers and other interests of the Council." Mr. Beachcroft urged that the Council ought not to stand in the way of an improvement of this kind, provided that their interests could be safeguarded, as he believed they could be. He contended that a new central London railway from east to west, following the line of Oxford-street and Holborn, was much needed for the convenience of the public, and he cited the City and Southwark Subway (now nearly completed) as a proof that such a work could be constructed without damage to property on the line of route. Mr. Collard, however, contradicted this statement, and said that there was scarcely a building in High-street, Borough, which had not suffered from the construction of the subway.

After a good deal of further discussion, the amendment was carried, and after transacting other business, the Council adjourned.

SALT IN CEMENT MORTARS.

SOME interesting particulars regarding the use of salt in the preparation of cement mortars which are to be subject to very low temperatures are given in the Transactions of the Institution of Civil Engineers (see vol. xcii., Abstracts of Papers, &c.). The information is taken from various sources, and is of considerable interest to those engaged in building operations. It is well-known that water contained in common salt in solution freezes at a lower temperature than fresh water, and it has been proposed to take advantage of this property in preparing mortars for use when the temperature is below freezing-point. It must not, however, be concluded that sea-water would answer the same purpose, as that contains other salts also.

From some experiments made in Russia, the following results were obtained:—Hydraulic lime and Portland cement were mixed with fresh water, and also with water containing 2 per cent. and 8 per cent. of salt in solution. Bricks cemented together with these mortars were allowed to set in the open air at temperatures ranging between 17·6 deg. F. to a little above freezing-point. Two cubes made from the different cements were subject to the same conditions. The cubes made with fresh water cement fell to pieces under pressure of the hand; and the bricks cemented with the same material did not adhere. The specimens prepared with water containing 2 per cent. of salt gave somewhat better results; but the samples made with water containing 8 per cent. of salt could only be destroyed by the aid of the hammer, and the bricks could not be separated. The Portland cement mortar was, in all cases, stronger than that made from hydraulic lime. Some operations carried out in America (see "Transactions of American Society of Engineers," March, 1887, p. 79), confirm the latter fact. In the construction of some canal locks, the work built with Portland cement, when examined the following year, turned out to be perfectly sound, but the hydraulic lime mortar had been destroyed to a depth of 3 to 4 in. In the course of erecting these works some concrete was laid in which a good deal of salt was mixed. The mass was completely frozen, but proved perfectly sound in the end, being impervious under a head of 15 ft. of water.

In the construction of a bridge in the United States, four piers were built, when the temperature was ranging in the case of the first between 1·4 deg. Fahr. and 21·2 deg. Fahr. During the building of the second the temperature was about 20 deg. Fahr., and the remaining two were built when the thermometer stood above the freezing-point. For the facework, Portland cement mortar, mixed with sand in the proportion of 1 to 1½, was used, and for the interior work 1 to 2½. The sand was warmed, and large quantities of salt were added to the water, yet at 1·4 deg. Fahr. the mortar froze very quickly while it was being used. In the end no difference could be discovered between the quality of the masonry of all the piers. The superiority of Portland cement over native American hydraulic lime is also testified by Mr. G. S. Morison, an American engineer. Test specimens of the two materials were frozen in water; those of Portland cement were uninjured, but the hydraulic lime samples fell to pieces. The Superintendent of Public Works for the State of New York, Mr. Shanahan, when building walls in cold weather, adds a strong solution of salt to the mortar.

ARCHITECTURAL SOCIETIES.

Manchester Architectural Association.—At the fortnightly meeting of this Association, held on the 4th inst., a paper was read by Mr. T. Chadwick, A.R.I.B.A., the subject being a few recent notes in Holland and Belgium. The paper was illustrated by sketches made by Messrs. Chadwick, Colley, and Woodhouse during a tour in September last. The route taken was from Harwich to Rotterdam, Delft, Dordrecht, Malines, Brussels, Ghent, and Antwerp. A cordial vote of thanks was accorded to Messrs. Chadwick, Colley, and Woodhouse.

Sunderland Architectural Students' Association.—At the first general meeting, February 7, a paper, on the "Study of Mechanics in their Relation to Architecture," was read by the President (Mr. Frank Caws), and, during the discussion which followed, it was arranged to have interim meetings for the study of the subject in detail, the President undertaking to conduct these interim classes on alternate Wednesdays, and give practical demonstrations on the black-board. At the general fortnightly meeting, February 21, a paper by Mr. H. Barnes, on the "Use of Wood and Iron in Building," and on March 7th a paper by Mr. F. J. Purvis, "On Stone as a Building Material," were read, and followed by interesting and instructive discussions, in which the younger students were encouraged to take part. In addition to the classes for the study of mechanics, another class, on alternate Wednesdays, meeting under the direction of Mr. William Milburn, is engaged in the study of Grecian architecture, illustrated by lime-light photographic views and diagrams. Mr. R. Elsey Smith has most kindly lent the Association a number of photographic slides, taken by himself, of Grecian buildings. The subject of Greek architecture was divided into the following details or branches:—History, Mr. H. Barnes; Plans, Mr. John Hall; Proportions, Mr. G. T. Brown; Shafts, Mr. J. Spain; Caps and Bases, Mr. A. B. Tiffin; Entablatures and Pediments, Mr. F. E. Coates; Ornament, Mr. E. S. Wilson; and the various students above-named undertook each the branch set against his name. The committee intend to further pursue this method of inducing all the students to share and take an interest in the work of study and preparation necessary to the successful carrying-on of this class.

ARCHÆOLOGICAL SOCIETIES.

British Archæological Association.—At the meeting of this Association on March 5, Mr. C. H. Compton in the chair, Mr. Earle Way exhibited some remarkable Gray-beard jugs found in Southwark, ornamented with coats-of-arms and having Dutch inscriptions as well as the usual head and beard of Cardinal Bellarmine. Mr. Davis described a candlestick of stone, of small size, found among some rubbish removed from a Gloucestershire church. It is circular in form and about 3 in. in height. Mr. Davis also produced a rubbing of a brass in Newlands Church, Forest of Dean, where a miner is depicted holding his candlestick in his mouth, a stick and a boss of clay at the extremity. It occurs on the brass called that of Sir R. Baynham. A rubbing of a brass in Wandsworth Church was also shown dated 1420, on which a knight is represented with a mace at his girdle. Mr. Saunders described the key of Portsmouth Town, which was thrown into the Harbour by Colonel Goring on the surrender to the Parliamentary Army. It is now in his possession, having been recovered in 1811. Mr. Oliver exhibited one of the well-known forgeries of the celebrated traders in spurious antiques known as "Billy and Charley." He did so as a warning to antiquaries, and the occasional exhibition of these will do a good deal to keep a record of their fabrication. A paper, illustrated by a large collection of rubbings of the objects referred to, which occupied one side of the Hall, was then read by Mr. Romilly Allen, F.S.A. (Scot.), on the Pre-Norman Sculptured Stones of the West Riding of Yorkshire. In the comparatively limited district under review twenty-six different localities occur in which sculptured stones have been found in churchyards, or in relation to churches, mostly in the valleys. The greatest number are found within a radius of twenty miles of Leeds. After dwelling upon the historical data, especially with regard to the introduction of Christianity in the seventh century, the lecturer referred to the style of ornamentation, which agrees in peculiarities of detail with what is found in other parts of the North of England, Lindisfarne being probably the centre of the art. The stones are covered with interlaced patterns, and consist of shafts and heads of crosses. Eleven inscribed stones have already been noted, one of which appears to relate to Osbert, killed in 867. Figure subjects occur not unfrequently, and at Bingley is an inscribed font, a photograph of which was exhibited.

Royal Archæological Institute.—The Right Hon. Earl Percy presided at a meeting of the Institute held on Thursday, the 6th inst., when Mr. Oliver read a paper on a brass to the memory of Roger Thornton which was originally placed on altar tomb in the Church of All Saints, at Newcastle-upon-Tyne. The figure of Roger Thornton was dressed in a long gown reaching to the feet. His wife's figure showed a long sleeveless gown with high collar. Mr. Oliver said that this brass was the only one of Flemish workmanship of the fifteenth century in this country. (We gave an illustration of this brass in the *Builder* for November 16 last.) Mr. J. Park Harrison read a paper on "Anglo-Norman Ornament compared with designs in Anglo-Saxon manuscripts." The paper was illustrated by many designs and copies from Early Saxon MSS. From these Mr. Harrison deduced that Saxon architecture was of a far superior description than what was generally supposed. Lord Percy exhibited a silver ornament, shaped like a crescent, which was found near Newham, Northumberland. It was probably of the fifteenth century.

The Surveyors' Institution.—The Council of this Institution have decided to give a prize of the value of 10*l.* out of the interest arising from the Crawter bequest to the candidate doing the best work in the field on Monday, the 24th inst., provided he obtains not less than 75 per cent. of the marks allotted to this branch of the Surveying and Levelling Examination.

Surveyorship, Bursiem.—The Burslem Corporation have appointed Mr. Fred. Bettany as their Engineer and Surveyor, in place of Mr. P. J. Sheldon, who has obtained the Essex County Council appointment.

BYZANTINE REMAINS IN GREECE.

SIR,—You were good enough about a year ago to advocate the work which was then being carried on by the British Archæological School at Athens in obtaining full-sized drawings of the profiles of the mouldings used in Greek architecture, and the response came in the form of subscriptions from various donors, which, if not a large sum, yet has been of very material use in arriving at a satisfactory result, which consists of a very complete collection of mouldings taken with scrupulous exactness by our architect student, Mr. R. W. Schultz. These will no doubt be published in some form or other.

Since the beginning of this year the opportunity of employing so competent an artist has not been lost sight of by the school, and Mr. Schultz has been re-engaged by the committee in concert with another architect, Mr. Barnsley, in making drawings of the Byzantine churches in Greece, of which there are some extremely valuable specimens. But their work is likely to be very seriously curtailed for want of funds, as the money which can be devoted to this purpose by the British Archæological School falls much short of what is due to the subject. Up to the present time the remains of this period in Athens itself have been examined, and one other very interesting and important specimen,—namely, the Monastery of St. Luke, near Mount Helicon; but the collection will be very imperfect if the remains at Mistra and some other parts of the Peloponessus are not included; which, unfortunately, cannot be done with the funds at present available. In a letter received lately from Mr. Gardner, the Director of the School, he says, "I am very sorry that Schultz and Barnsley are so short of money, and I fear they will be obliged to curtail their plan, and only finish off the churches they have begun without going further afield. I think this will be a great pity, as their work strikes me as more excellent than ever, especially their drawings of St. Luke."

Under these circumstances, I write to ask if you would allow me, through your columns, to invite subscriptions from the lovers of archæology in general, and early Mediæval work in particular, for the purpose of making this undertaking more complete.

Subscriptions may be sent to Walter Lea, Esq., Old Change, the treasurer to the British Archæological School; or should you think, sir, as on the former occasion, that a special subscription fund would be desirable, I should be willing (should you so desire it) to receive the subscriptions, and from time to time announce them in the *Builder*, in which case I would ask the donors to distinguish any such subscriptions from others intended for the Greek Mouldings Fund; to signify in some way or other that Byzantine architecture is their aim. F. C. PENROSE.

68, *St. Paul's-churchyard.*

*** We certainly desire it.—ED.

THE GLASGOW MILL DISASTER.

SIR,—In reference to your interesting article on the fall of the Glasgow mill, it would be most instructive to your readers if a plan and section were given, the direction of the wind and its pressure per square foot.

I know that at most meteorological stations the apparatus is so imperfect that the wind gauges are generally blown away in a storm, but it may be hoped that this was not the case there. GEORGE AITCHISON.

"A CLAIM ON A BILL OF EXTRAS."

SIR,—Our clients, Messrs. Kirk & Randall, have called our attention to the paragraph in your last issue* headed "A Claim on a Bill of Extras," and we desire to point out to you several inaccuracies in that report.

You state that it was shown that the amount in dispute had been paid by the Baths Commissioners to Messrs. Kirk & Randall. As a matter of fact one of the Commissioners, who was present at the meeting, and our client, both positively stated that the account in which the item in dispute was included was not before the Commissioners at the time of settlement, and the Judge found, as a fact, that the item was not present to the minds either of the Commissioners or our clients at the time of settlement, and that our clients had never, personally, any knowledge of the item at all.

The plaintiffs' own evidence was that although they had been repeatedly warned by Messrs. Kirk & Randall that no amounts would be paid for unless orders were received from them, they had not in this case received any such orders, and they had not communicated the fact of the work being done to Messrs. Kirk & Randall. Furthermore, the contention of the defendants was not that the architect had exceeded his authority, but that the amount had not been included in the sum paid to them, and that it had never been received by them, as they had no knowledge whatever of the plaintiffs' claim in settling their accounts, and were, therefore, under no liability to pay the amount.

We should be obliged if you would in fairness to our clients call attention to these facts in your next issue.

We defer saying more on the subject as the case is now under appeal.

MACKRELL, MATON, & GODLEE.

21, Cannon-street, E.C., March 6.

[This letter arrived too late for insertion last week. Our reporter informs us that our report, although brief, was substantially in accordance with the evidence; that it was proved that the item in dispute *was* in the accounts which were before the Baths Commissioners at the time of settlement, and that no exception was taken to it; that these accounts had been prepared jointly by the quantity-surveyors representing the builders and the building-owners respectively; that although it is true that evidence was tendered as to the plaintiffs having been cautioned by the defendants against executing orders received otherwise than through the defendants, it was proved that the architect, Mr. Verity, had ordered the goods in question (which he had ample power to do under the terms of the contract), that they had been duly supplied, and that the architect had authorised the amount in dispute to be included in the accounts. On one point only was our reporter slightly in error, and that was in describing the nature of the action. It was not, technically speaking, an action to recover money for goods supplied to defendants, but it was an action to recover money had and received by defendants on behalf of the plaintiffs.]

* See *Builder*, March 1, p. 158.

"HISTORY OF CROMER."

SIR,—Will you kindly allow me space to correct an error in your last edition in reference to the above. In referring to the church, you say, "The restoration of the nave was done by Mr. Newman." This is not quite correct, as the work was carried out by the late Mr. E. Summers and myself, Mr. Newman only having the sub-contract for the bricklayers' work. W. CHAPMAN.

Hanworth, Norfolk, March 12, 1890.

*** It is not our mistake; we merely took the statement as given in the book.

Technical Institutions in Berlin.—Mr. Brunner, M.P., during a recent visit to Berlin, took special interest in the affairs relating to the organisation of the institutions for technical education in Germany, and those at Berlin especially. Thanks to the "Rector," Prof. Jacobsthal, Mr. Brunner had the opportunity of inspecting all the interior arrangements of the Royal Technical College, and besides viewing the aula, the library, and reading-rooms, the lecture-halls, class-rooms, studies, and minor details of the main building, he also went over the Architectural Museum (of which Professor Raschdorff is the director) and some of the educational collections (building construction, building materials, geological, civil engineering, technological, and ship building). A visit was paid to the building belonging to the Chemistry division, and here the laboratories of the inorganic department (Prof. Ruedorff) were specially gone through. The Royal Testing Laboratory and workshops were visited, and here the head of the institution, Prof. Martens, explained the different apparatus used, especially those used for testing iron and steel, and those used for the testing of paper as to wear, tear, and discolour.

The Association of Municipal Engineers notify that the ninth examination of candidates for the offices of Municipal Engineer and Local Board Surveyor will be held at the Institution of Civil Engineers on Friday and Saturday, April 18 and 19 next. The Association of Municipal Engineers was instituted in 1875, and now numbers some 420 members. It has done a great deal to raise the standard of qualification for the professional officers of municipalities and Local Boards.

The Student's Column.

ELECTRICITY, MAGNETISM, AND ELECTRICITY SUPPLY.—XI.

DYNAMO-ELECTRIC MACHINES.

WELL-ILLUSTRATED descriptions of the details of all the important forms of dynamo-machines that are made appear from time to time in the pages of engineering papers. To these articles is referred a student who wishes to see how the general principles of dynamo-electric machinery, dealt with in this and future articles, are applied in practice. We have already explained —article VII.—how and in what direction E.M.F. is set up in a conductor which is being cut by lines of force; fig. 26 represents lines of

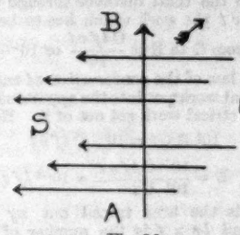

Fig. 26.

force between the N and S poles of the field magnet of a dynamo-machine. If the conductor A B move into the paper, the direction of the E.M.F. produced will be from A to B; some such diagram, showing the relative directions of lines of force, motion, and electromotive force produced, should be committed to memory, though the following rule may prove useful if it is borne in mind that at the earth's surface lines of force go from south to north:—*If a man walks towards the east an E.M.F. is set up from his feet to his head.* In practice, however, the moving conductor is not a mere rod like A B, nor does the field consist of straight lines of force as in fig. 26. It is, therefore, necessary in many cases to consider parts only of the conductor at a time, and then to see in what direction acts the added electromotive forces, set up in the different parts. It frequently happens that a conductor cuts lines of force, so that the E.M.F. set up in one part opposes that set up in another, in which case the difference between the two is all that is available for use. Before the quantity can be calculated the numerical value of the E.M.F. set up in a conductor moving in a magnetic field must be known.

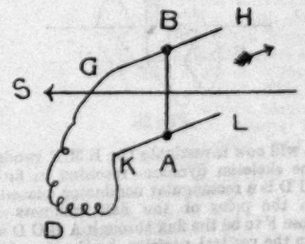

Fig. 27.

In Fig. 27, A B is a conductor which slides between two fixed rods G H and K L, metallic contact being made with them at A and B, so that any E. M. F. which may be set up in A B will produce a current in the closed circuit A B D A. Let the resistance of this circuit be R and the resistance of the rods G H and K L be so small that the varying length of rod introduced into the circuit, as A B moves, does not appreciably alter the total resistance. If a uniform field of force pass through the apparatus in the direction N S and the conductor move in the direction of the arrow, an E. M. F. is set up in the direction A B and a current C flows in the direction A B D. Let l = length of A B, v = speed with which it moves, f = strength of field, E = E. M. F. set up, and t = time taken by A B to move from G to H.

Then E = C R, and the work in Joules done in the circuit is E C t, that is, 10^7 E C t ergs, as explained in article V. Again, in the same article it was shown that if a conductor of length l, carrying a current of C amperes, was bent into the form of a circle of unit radius,

it exerted a force of $\frac{Cl}{10}$ dynes on a unit magnetic pole placed at its centre, or a force of $\frac{Clm}{10}$ dynes on a pole of strength m; but since action and reaction are, by Newton's third law, equal and opposite, the conductor itself experiences the same force, though in the opposite direction; as, therefore, the pole of strength m produces a field of strength m at one centimetre distance, in the neighbourhood of the conductor and at right angles to the direction of the current at every point, the force produced is $\frac{Cl}{10}$ multiplied into the strength of field into which it has been introduced. Applying this to the present case, the movement of A B is resisted by the force $\frac{Clf}{10}$, and since the total distance through which it moves is vt the work which has to be done to move it from G to H is $\frac{Clfvt}{10}$ or $10^{-1}Clfvt$.

By the law of the conservation of energy, the mechanical work put into the apparatus is equal to the electrical work got out of it. Hence:—

$$10^7 \, E \, Ct = 10^{-1} \, Clfvt$$

$$E = \frac{10^{-1} \, Clfvt}{10^7 \, Ct} = 10^{-8} lfv \qquad (1.)$$

But lv is the area traced out by A B per second, and $lv \times f$ is the number of lines of force cut by A B per second; so that equation (1.), which is of fundamental importance, may be stated in words as follows:—The electromotive force set up in a conductor is equal to the number of lines of force through which it cuts per second multiplied by 10^{-8}.

It appears, then, that to get one single volt, a conductor must cut, in the same direction, no less than one hundred million lines of force per second.

There is now working at Deptford a dynamo-machine which gives 10,000 volts electromotive force, so that 10^{12} or 1,000,000,000,000 cuttings of lines of force by conductor per second must take place. At first sight this figure seems very extraordinary, but it must be remembered firstly, that the actual number of lines of force in the field or set of fields in a dynamo amounts to many millions; secondly, that each conductor is not a simple rod as in fig. 27, but is wound into a bobbin of many turns, so that each line in the field is cut several times by the same conductor; and, thirdly, that the armature revolves many times per second. Each of these factors *multiplies* the E.M.F., so that it is not so astonishing after all that the number of cuttings reaches the enormous figure it does.

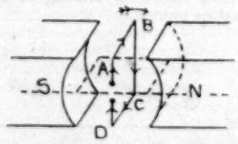

Fig. 28.

We will now investigate the E.M.F. produced by the skeleton dynamo-machine in fig. 28. A B C D is a rectangular conductor placed between the poles of the field magnets N S. Suppose F to be the flux through A B C D when it is in the vertical position, by the time it has turned into the horizontal position A B and C D have together cut every line, *i.e.*, F lines, setting up an E.M.F. in the direction shown. In one complete revolution 4 F cuttings take place, and if the rectangle is revolved n times per second, the number rises to $4 \, n$ F per second, so that an *average* E.M.F. of $10^{-8} \times 4 \, n$ F volts is produced.

To give an idea of what this E.M.F. may be likely to come to, suppose the area of the rectangle to be—say, 150 square centimetres, then 10^8 would not be an out-of-the-way value for F; if the number of revolutions per minute is 600, $n = \frac{600}{60} = 10$. Let E = E.M.F. in rectangle, then $E = 10^{-8} \times 4 \times 10 \times 10^8 = 4 \times 10^{-1} = 0{\cdot}4$ volt.

It must be noted that *average* electro-motive force is spoken of, as by tracing the E.M.F. set up in the conductor as it revolves it will be seen that the direction reverses at the instant when the rectangle is vertical: hence in the vertical position $e = 0$, if e is the actual E.M.F. at any instant; in the horizontal position e has its maximum value, and sinks again to zero a second time at the vertical position. We shall not trouble ourselves about this while considering machines used for giving a continuous current, because a number of conductors are connected up so that when one is contributing its maximum effect another is contributing no E.M.F. at all, the other conductors being in intermediate positions. When, therefore, all the effects are added the result is an E.M.F. equal to the average E.M.F. given by one conductor multiplied by the number of them so connected; thus by proper connections and commutation a practically constant, though slightly fluctuating, E.M.F. is obtained for external use.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

3,600, Scavenger Carts. A. H. and J. E. Hayes.

The carts made under this specification are covered to prevent spilling the liquid slop or the dust being blown about by the wind, and side and end boards are fitted to increase the carrying capacity for light dust without interfering with the action and protection of the mechanical cover. These extra boards are provided with iron pintles, which fit into sockets at the back and sides of the cart, the front being built up solid of sufficient height to close up the crown of the covering. The centre board, on which the covering-flaps are hinged, is of sufficient height to permit the flaps to conveniently rest on the top of the additional side-boards, so as still to make a joint thereon for protecting the contents as efficaciously as when the heightening boards are removed without interfering with the action of the flaps. When the contents are to be discharged, the door, on tipping, is automatically opened so as not to cause any interference with the fixed cover.

4,432, Balanced Sashes. W. S. Ingle.

The sashes, which are the subject of this invention, are hung so that one half balances the other. A grooved pulley, working in a case bracket, is employed, and fixed to the top of each internal side of the window-frame, the centre of the pulley being midway between the two side window-sash frames. Over these pulleys is passed a cord or chain, one end of which is fixed to each top sash-frame, and the other to the bottom sash-frame. When one is lowered the other is raised correspondingly.

4,645, Door and Window-fastenings. Ellis Parr.

This invention relates to the form of fastening in which, when it is applied (for example) to a door, the latter is held sufficiently firmly in a closed or desired position; but can be opened or removed when desired by simply pressing it in either direction. A plate has a rectangular aperture stamped out, the edges of which are left standing at right angles to the side, the bolt is passed through past the aperture, and through a spiral spring in the centre of the aperture. This forms the fastening.

4,853. Centre Bits and Boring Tools. R. J. Anderson.

According this invention, a tool for drilling or boring, whereby the diameter of the holes to be bored may be adjusted, is made by employing an arm of suitable length pivoted to the bit or tool. The extremity of this arm has a cutting edge. The end of the tool is spread out to form wings having a flat surface forming a support for the arm, and giving space for a slot, into which is fitted a tightening screw. To adjust the tool to make a hole of a proper size, the arm is rotated on its pivot till the size is attained, it is then locked and fixed by a screw.

5,205, Terra Cotta Blocks. H. Doulton and another.

According to this invention blocks are made with a number of small cells or cavities similar to the holes in perforated bricks, except that in place of running completely through the block they are only open at one face, stopping short of the opposite face. The blocks may be moulded at the closed end, and owing to the smallness of the cells can be employed for building purposes without any filling, and yet since the cells on them are open at one end the clay can dry thoroughly.

5,595, Chimney Pots. R. Roberts.

At a short distance below the cover of the pot, a dish-shaped ring is, according to this invention, fixed around it to serve as a preventive in case of the rebound of the wind—as, for instance, from a roof or wall on this ring the wind impinges and down draught is prevented.

NEW APPLICATIONS FOR PATENTS.

February 24.—2,912. H. Badams, Gas-brackets and Chandeliers.—2,941, G. Appiani, Continuous-acting Kiln.

February 25.—2,965, H. Brookfield, Flushing Water-closets, Drains, &c. — 2,966, G. Bayley, Fastenings for Window-sashes.—2,983, J. Collins, Combined Sash-fasteners and Lifts. — 3,021, J. O'Brien and J. Carew, Stone-cutting Chisels, &c. — 3,025, G. West, Plastering Material or Compositions.

February 26.—3,075, G. Light, Intercepting-traps for Drains, &c.

February 27.—3,162, J. Merryweather, Paving Materials.

February 28.—3,184, A. Rovedino, Wood Paving Block or Brick.—3,197, J. Bott, Circular Saws.—3,205, F. Cook, Lightning Conductors.—3,215, R. Meredith, Fastening Door-knobs to Spindles.—3,217, C. Spurr, Cutting Veneers.—3,221, W. Hawkins, Flushing Apparatus for Water-closets.

March 1.—3,258, E. Marples and F. Lamburn, Combination Tool Cabinets.—3,266, B. Townson and J. Dixon, Horizontal Sawing-machines.

PROVISIONAL SPECIFICATIONS ACCEPTED.

791, R. Crowden and R. Pulton, Paperhangers' Roller.—1,054, J. Connell, Sash Fasteners for Window-sashes and Doors.—1,353, W. Young, Securing Sash-lines to sashes.—1,418, A. Rammage, Metal Framing for Fire-proof Floors and Walls.—1,544, G. Newman, Bolts or Fasteners.—1,619, L. Shilton, Electric Bells or Gongs.—1,689, W. Nash, Securing Windows.—1,730, J. Merrill, Cisterns for Water-closets, &c.—1,759, J. Jones and S. Edwards, Automatically raising Water-closet Seats, &c.—2,008, R. Evered and N. Coleman, Flushing Drains, &c.—2,190, E. Jobson, Open Stoves or Fire-grates.—2,445, A. Osborne, Heads and Screws.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

3,376, J. Beeker and W. Winsloe, Cleansing, Whitewashing, Staining, and Painting Ceilings.—5,175, T. Wintour, Ventilating.—5,919, W. Lea and H. Lynam, Refractory or Fire-resisting Cement.—6,177, J. & B. Taylor, Preventing the Slipping of Ladders, &c.—6 819, J. Jacquimin and E. Segretan, Closing Orifices in Drain-pipes.—6,874, J. Tata and J. Lyon, Mosaics for Floors, &c.—6,898, W. Barwell, Draught, Rain, and Dust Excluder for Doors.—7,197, A. Goslin, Flushing Cisterns.—8,201, W. Allenby, Retaining Windows at any desired Height.—8,845, N. Proctor and others, Bricks, &c.—20,947, R. Haddon, Water-closets.

RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

March 3.—By Ventom, Bull, & Cooper.

St. John's Wood—4, Lodge-rd., u.t. 34 yrs., g.r. £40 ..... £12

By J. C. Platt.

Acton Green—30 and 32, Antrobus-rd., f., r. £72. 10s. p.a. 630

Westbourne-pk.—4, Lancaster-mews, u.t. 73 yrs., g.r. £4. 10s., r. £36. 8s. 220

9, Westmoreland-mews, u.t. 69 yrs., g.r. £5, r. £30 200

By G. A. Bickerton.

Clapham—73, The Chase, u.t. 79 yrs., g.r. £7. 10s., r. £40 330

Finsbury-pk.—37, Digby-rd., u.t. 86 yrs., g.r. £7, r. £40 350

By C. Fuller & Son.

Stepney—1 and 3, White Horse-lane, u.t. 74 yrs., g.r. £10 355

Buckhurst Hill, Palmerston-rd.—"The Hollies," f.r. £75 980

By Phillips, Lee, & Davies.

Holborn—The lease of 8, Smart's-buildings, u.t. 36 yrs., r. £280 p.a. 500

March 4.—By G. Robins.

Caledonian-road—75 and 77, Pembroke-st., u.t. 59 yrs., g.r. £2, r. £89. 14s. 730

New Southgate—6 to 11, Edward's-ter., and 1, Osborne Villas, u.t. 88 yrs., g.r. £30, r. £109. 4s. 300

Camberwell—F.g.r. of £35, with reversion in 72 yrs. 730

By Rutley, Son, & Vine.

Kentish Town—37, Dickenson-st., u.t. 77 yrs., g.r. £6, r. £36 295

Holloway—22, 24, and 24a, Vorley-rd., u.t. 69 yrs., g.r. £14 415

Brunswick-sq.—39, Compton-st., u.t. 15 yrs., g.r. £8, r. £30 p.a. 105

By Chesterton & Sons.

Kensington—35, Holland-rd. Villas, u.t. 61 yrs., g.r. £25 1,700

By W. Hall.

Hampstead—Cleve-rd., "Woodcote," and plot of land, f. 4,000

New Barnet—East Barnet-rd., a plot of f. land 350

Hackney—41, Casterton-st., u.t. 88 yrs., g.r. £8, r. £33. 16s. 200

Kilburn—1, Falconer Mews, u.t. 73 yrs., g.r. £5 250

Notting Hill—27, Wheatstone-rd., u.t. 85 yrs., g.r. £7. 10s. 100

MARCH 5.—By M. HUBBARD.

Kentish Town—25, Caversham-rd., u.t. 58 yrs., g.r. 5s.	£660

By NORTON, TRIST, AND GILBERT.

Peckham—15, Bellenden-rd., f.	670
14, Stanbury-rd., u.t. 85 yrs., g.r. £4. 10s., r. £29. 18s.	185
Upper Clapton—"The Cazenoves" and 3¼ acres, f. and 1¼ acres l.	5,300
Kingsland-rd.—Nos. 57 to 61 (odd), f., area 39,100 ft.	8,600

By PROTHERO & MORRIS.

South Kensington, Clareville-grove—"Clareville Lodge," u.t. 33 yrs., g.r. £6	1,300

MARCH 6.—By W. W. JENKINSON.

Norwood—3, The Avenue, u.t. 47 yrs., g.r. £2. 1s.	1,070

By Messrs. CRONIN.

Croydon—34, Northcote-road, f.	295

By W. J. NEWELL.

Deptford—104, St. John's-rd, u.t. 36 yrs., g.r. £2. 7s. 6d., r. £30	255
Old Kent-rd.—55, 57, and 59, Asylum-rd., u.t. 18 yrs., g.r. £18, r. £79	240
1, 4, and 5, Gervase-rd., u.t. 18 yrs., g.r. £5. 10s., r. £71. 10s.	230
Brixton—66, Sussex-rd., u.t. 32 yrs., g.r. £3. 3s., r. £25	325

By FOSTER & CRANFIELD.

Old Broad-st.—12, Union-ct., f., area 426 ft., r. £135	3,975

By H. GRIFFIN.

Battersea—Acorn Wharf, f., area 7,000 ft., r. £96	1,850

By NEWBON & HARDING.

Highgate, Cromwell-avenue—The residence called "Caerleon," f.	1,100
Highbury—98, Highbury Quadrant, u.t. 59 yrs., g.r. £15. 15s.	700
Finsbury Pk.—216, Green Lanes, u.t. 32 yrs., g.r. £7. 10s.	580
Pentonville—1 and 2, Vernon-sq., u.t. 29 yrs., g.r. £10, r. £105	760
7, Vernon-st., u.t. 29 yrs., g.r. £5, r. £45	455
Notting Dale—Kensington—17, 19, 21, and 23, Woodland-rd., u.t. 73 yrs., g.r. £20	910

By C. G. COLES & Co.

Notting-hill—60 and 62, Portobello-rd., u.t. 52 yrs., g.r. £9	420
68 and 70, Portobello-rd., u.t. 52 yrs., g.r. £9, r. £79	515
30 and 32, Portobello-rd., f., r. £60 p.a.	910

MARCH 7.—By C. D. FIELD & SONS.

Borough—7, Maze-rd., f.	430
6, Ladd's-court, f., r. £16. 18s.	115
16, Noah's Ark-alley, f., r. £19. 10s.	120
Bermondsey—16, Guy-st., u.t. 23 yrs., g.r. £4., r. £38. 12s.	135
Blackfriars—106 and 108, Broadwell, c.	300

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; yd. for yard, &c.]

MEETINGS.

SATURDAY, MARCH 15.

Royal Institution.—The Right Hon Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." V. 3 p.m.

MONDAY, MARCH 17.

Royal Institute of British Architects.—(1) Mr. Alfred Strong on "Drawings of Brick Buildings in North Germany, erected from the designs of Professor Otzen, of Berlin." (2) Mr. William White on "The Galilee of Durham Cathedral" 8 p.m.

Society of Arts (Cantor Lectures).—Professor A. H. Church, M.A., on "Some Considerations Concerning Colour and Colouring." I. 8 p.m.

Liverpool Architectural Society.—Miscellaneous Contributions. 7 p.m.

Leeds and Yorkshire Architectural Society.—Mr. Paul Waterhouse, M.A., on "The Work and Writings of Henry Aldrich." 7.30 p.m.

TUESDAY, MARCH 18.

Institution of Civil Engineers.—Mr. J. Price, jun., R.E., on "Lough Erne Drainage." 8 p.m.

Sanitary Institute (Lectures for Sanitary Inspectors).—Mr. J. F. J. Sykes, B.Sc., on "General Powers and Duties of Inspectors of Nuisances.—Method of Inspection." 8 p.m.

Society of Arts (Foreign and Colonial Section).—Mr. J. Walls on "Brazil." 5 p.m.

WEDNESDAY, MARCH 19.

Free Lectures to Artisans and others on Matters Connected with Building.—Professor W. C. Unwin, F.R.S., on "The Construction of Walls." Carpenters' Hall, London-wall. 8 p.m.

Institution of Civil Engineers.—Students' visit to the Richmond Main Drainage Works. Meet at Kew Gardens Railway Station at 1.30 p.m.

Civil and Mechanical Engineers' Society.—Mr. H. C. Paton on "Gold Mining in Merionethshire." 7 p.m.

Society of Arts.—Mr. J. S. Keltie on "Commercial Geography." 8 p.m.

British Archæological Association.—Mr. W. Money, F.S.A., on "The Seal of the 'Dean of Newbury,' 1432." 8 p.m.

THURSDAY, MARCH 20.

Edinburgh Architectural Association.—Principal F. Grant Ogilvie on "Electric Lighting of Interiors." 8 p.m.

FRIDAY, MARCH 21.

Sanitary Institute (Lectures for Sanitary Inspectors). Mr. J. F. J. Sykes, B.Sc., on "The Nature of Nuisances, including Nuisances the Abatement of which is difficult." 8 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. L. A. Legros on "Economy Trials of a Compound Mill-engine and Lancashire Boilers." 7.30 p.m.

Royal Institution.—Professor G. F. Fitzgerald, M.A., F.R.S., on "Electromagnetic Radiation." 9 p.m.

Sunderland Architectural Students' Association.—Mr. F. Purvis on "Stone as a Building Material." 7.30 p.m.

SATURDAY, MARCH 22.

Architectural Association.—Visit to the new Central Offices for the Metropolitan Police on the Victoria Embankment, Mr. R. Norman Shaw, R.A., architect.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." VI. 3 p.m.

Miscellanea.

Sales of Building Property at the Mart.—Two well-favoured properties at Hampstead will be put up to auction within three or four weeks hence, and in all likelihood will be devoted to general building purposes. These are the Priory Lodge and Frognal Hall estates, situated between St. John's parish church and the top of West End-lane, and covering about six acres in all, with 1,000 ft. frontage to Frognal and Church-row. Priory Lodge is close to the site of the Priory built by "Memory Corner" Thompson, an auctioneer and valuer, over the ruins, as he claimed, of an ancient priory, formerly occupied by Cardinal Wolsey, as a rural retreat. But it is to be remembered that the real priory, Godwin's hermitage, *temp.* Henry I., converted into a nunnery of St. Benedict, lay at Cunebour, or Kilburn. At Frognal, in the older maps, are marked one or two ponds, feeders of the West Bourne, or Ay Bourne, whereof a branch ran towards Kilburn. The old manor-house of Hampstead originally stood upon the opposite (or northern) side of West End-lane. It was rebuilt by the name of Hall Oak Farm. Park, in his "Topography and Natural History of Hampstead" (1818), conjectures that this manor's pristine name was Frogen-hall. He also says that in Sir Samuel Bentham's day there stood in the garden a handsome old pollard, being the particular oak-tree which Bentham had always understood gave its name to the manor farm. Thompson's Priory, which he filled with a strange collection of curiosities and pseudo-rarities, is now demolished. Lord Alvanley, Lord Chief Justice of the Common Pleas, occupied, *teste* Walford's "Old and New London," Frognal Hall; he died there on March 19, 1804. Isaac Ware, the architect, and editor of Palladio's works, lived, for a while, in Frognal Hall. Hard by, in West End-lane, being, as Park tells us, "the last house in Frognal (southward)," and standing in his day, was the house which Dr. Johnson rented for his wife, and to which he himself occasionally resorted. There, as we read in Boswell, he composed (1748) the greater part, if not the whole, of "The Vanity of Human Wishes, being the Tenth Satire of Juvenal Imitated."

The Tansa Water Scheme.—That this is the greatest scheme of a gravitating water-supply for a city in India is well known. The first survey was made by Major Hector Tulloch, now Senior Inspector of the Local Government Board in England, in 1870. It was first brought before the Corporation as a project to be executed on July 27, 1883, when it was ably supported by Dr. Weir, and was accepted. The area of the water-spread, when the dam is completed up to the height which it is now intended to be carried, will be about seven square miles, while the catchment area is fifty-two square miles. The water from the reservoir will be led into Bombay by five miles of tunnels, twenty-five miles of ducts, and nineteen miles of 48-in. mains. These will carry the water to Ghat Kooper. From Ghat Kooper into Bombay there will be twelve additional miles of mains. The final surveys and necessary modifications which were found to be required were made by Mr. Clerke, the talented engineer of the works, under whose immediate superintendence they are being executed.—*Indian Engineering.*

New English Art Club.—This Club has secured the Galleries in Humphreys' Mansions, Knightsbridge, for its next Exhibition. The private view is fixed for March 29.

The English Iron Trade.—The English iron market is quieter, if anything, and its tendency is still downwards. Very little is being done in pig-iron, makers holding on pretty firmly to their quotations, while buyers generally purchase of merchants. Scotch warrants are again lower on the week, the result being that makers in Scotland have reduced their prices from 6d. to 2s. a ton, according to brand. Middlesbrough pig has lost 1s. 3d. a ton. In other districts prices are easier. Although makers of hematite pig are putting into practice their agreement of blowing out furnaces, to counteract the effects of operations in warrants, they have lowered their prices 3s. a ton. Manufactured iron is unsettled, and very little business is put through. The market is easier on the whole, merchants offering under makers' prices, and in the north of England ship-plates and angles have fallen. The tone of the steel market is anything but steady, and in the north-west wire rods have lost 5s. a ton, while rails and blooms have dropped 12s. 6d., and billets and slabs 15s. a ton. Ship-building material is also generally cheaper. There are no fresh orders for ships, and engineers are getting quieter.—*Iron.*

A New Source of Portland Cement.—A new source of supply of Portland cement has been opened up by the recent discovery of the immense deposit of carbonate of lime and cement clay underlying the former in the county of Grey, Ontario. The deposit is only two miles from the Grand Trunk Railway of Canada, and only nine miles from Owen Sound of the Georgian Bay. The carbonate of lime is stated to be purer than the European chalk, and the clay much the same as the well-known Medway clay, and contains 62 per cent. of soluble silica. Canada imports about 100,000 barrels of Portland cement annually, and the United States procure from Europe over 1,000,000 barrels. Not a barrel of Portland cement of commerce has, so far, been made in America, although an inferior kind of cement or water lime is manufactured. The reason is obvious, no carbonate of lime having heretofore been found on the American continent pure enough to make superior Portland cement. It is believed that a cement superior to any imported can be produced as cheaply as European manufacturers are able to place the raw material on the ground.

Free Lectures at Carpenters' Hall.—The fifth of the present series of free lectures to artisans and others on matters connected with building, under the auspices of the Worshipful Company of Carpenters, was delivered on Wednesday, the 5th inst., by Professor A. B. W. Kennedy, F.R.S., his subject being "The Forth Bridge." Mr. Alfred Preston presided, and there was a crowded attendance. The lecture was illustrated by a large number of photographic slides shown by means of a lantern.——The sixth lecture was delivered on Wednesday evening last by Professor Marshall Ward, M.A., on "The Tree, from the Sapling to the Bench." This lecture also was illustrated by lantern views. Mr. Wyatt Papworth, F.R.I.B.A., Master of the Clothworkers' Company, presided, and there was again a large attendance.

Lock-out of Kentish Brickmakers.—We regret to see that, owing to the strike of Kentish bargemen, there has been a lock-out of brickmakers. A special meeting of the Committee of the Brickmakers' Association was held in London last week, to receive a deputation from the Bargemen's Society, but a letter was read from the latter postponing the conference. On Saturday the edict of the Kentish brickmasters to close their works and to lock-out their hands came into force. This had the effect of turning some 5,000 people out of employment in the Sittingbourne district alone. The men have been told that they are locked-out pending the settlement of the dispute with the bargemen.

Berlin.—The exhibition of "Stone Road-making Materials," which had been organised by the Amalgamated Association of Paviors, and was held here recently, cannot, although very interesting and fairly well managed on the whole, be termed a success, partly owing to the inexact and very incomplete cataloguing, and partly on account of the non-marking of the prices on the exhibits. The idea of having such an exhibition was certainly good; for, however much asphalt and wood-paving may come in use, stone-paving, especially that of a superior sort, will never die out. The Association intends repeating the exhibition on a larger scale and with greater care.

Mr. P. H. Rathbone and the St. George's Hall Panels.—Mr. P. H. Rathbone has addressed a letter to the Town Clerk of Liverpool acknowledging the letter accepting his offer of the remaining panels for St. George's Hall, and adding that he hopes this "may be one step in restoring to British architecture that human interest which was alike the glory of Grecian and Gothic architecture, including our own cathedrals, and which alone spoke to the heart of the people until it was crushed by Henry VIII. and the great Protector of Edward VI.'s reign, but which makes every principal street in Florence a page of Florentine history, which he who runs may read."

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	7 0 0	7 15 0
Teak, E.I. ....load	12 0 0	14 0 0
Sequoia, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	3 0 0	4 5 0
Birch ,, ...	3 0 0	4 15 0
Elm ,, ...	3 10 0	4 15 0
Fir, Dantsic, &c.	2 0 0	3 10 0
Oak ,, ...	2 10 0	4 10 0
Canada	5 10 0	7 0 0
Pine, Canada red	2 10 0	3 10 0
,, yellow	3 0 0	5 5 0
Lath, Dantsic ....fathom	4 10 0	5 10 0
St. Petersburg	5 0 0	6 10 0
Wainscot, Riga, &c. ....log	0 0 0	0 0 0
Deals, Finland, 2nd and 1st. std. 100	8 10 0	11 0 0
,, ,, 4th and 3rd	7 0 0	8 0 0
Deals—Riga	7 0 0	9 0 0
St. Petersburg, 1st yellow	11 0 0	14 0 0
,, 2nd ,, ...	9 0 0	10 10 0
,, white	6 10 0	10 0 0
Swedish	7 10 0	16 0 0
White Sea	9 0 0	17 0 0
Canada, Pine, 1st	16 0 0	26 0 0
,, ,, 2nd	11 0 0	17 10 0
,, ,, 3rd, &c.	8 0 0	10 10 0
,, Spruce, 1st	9 0 0	11 0 0
,, ,, 3rd and 2nd ..	7 0 0	9 0 0
New Brunswick, &c.	6 0 0	8 10 0
Battens, all kinds	6 0 0	17 0 0
Flooring Boards, sq., 1 in., prepared, First	0 11 0	0 14 0
Second	0 8 0	0 10 6
Other qualities	0 6 0	0 7 9
Cedar, Cuba ....foot	0 0 4	0 0 5
Honduras, &c.	0 0 4	0 0 4½
Mahogany, Cuba	0 0 5	0 0 6½
St. Domingo, cargo average ..	0 0 5	0 0 6½
Mexican, cargo average	0 0 4½	0 0 5½
Tobasco ,, ...	0 0 5½	0 0 6½
Honduras ,, ...	0 0 5½	0 0 6½
Box, Turkey ....ton	4 0 0	13 0 0
Rose, Rio	15 0 0	20 0 0
Bahia	14 0 0	18 0 0
Satin, St. Domingo ....foot	0 0 9	0 1 3
Porto Rico	0 0 10	0 1 6
Walnut, Italian	0 0 4½	0 0 6½
IRON—METALS.		
Bar, Welsh, in London ....ton	8 2 6	8 10 0
,, ,, at works in Wales	7 15 0	8 0 0
,, Staffordshire, in London..	8 10 0	9 10 0
COPPER—British, cake and ingot	52 10 0	53 10 0
Best selected	54 0 0	55 0 0
Sheets, strong	62 0 0	0 0 0
Chili, bars	47 0 0	0 0 0
YELLOW METAL....lb.	0 0 5½	0 0 6
LEAD—Pig, Spanish ....ton	12 10 0	0 0 0
English, com. brands	12 10 0	12 12 6
Sheet, English	14 15 0	0 0 0
Pipe	15 5 0	0 0 0
TIN—Straits	91 0 0	0 0 0
Australian	91 5 0	0 0 0
English Ingots	95 0 0	0 0 0
OILS.		
Linseed ....ton	22 10 0	22 15 0
Cocoanut, Cochin	26 10 0	0 0 0
Cocoanut, Ceylon	24 10 0	0 0 0
Palm, Lagos	24 10 0	0 0 0
Rapeseed, English pale	33 10 0	0 0 0
,, brown	32 0 0	0 0 0
Cottonseed, refined	22 7 6	22 10 0
Tallow and Oleine	21 0 0	40 0 0
Lubricating, U.S.	5 10 0	6 10 0
,, refined	7 0 0	12 0 0
TAR—Stockholm....barrel	1 6 0	0 0 0
Archangel	0 17 6	0 0 0

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

BIRMINGHAM.—For the erection of new business premises, Union-street, for Messrs. Chamberlain, King, & Jones. Messrs. Titley & Jones, architects, Bennett's-hill, Birmingham :—

Thos. Smith	£3,590 0 0
John Bowen	3,556 0 0
W. J. Webb	3,495 0 0
John Barnsley & Sons	3,428 0 0
Wm. Sapcote & Sons*	3,388 0 0

* Accepted provisionally.

BIRMINGHAM.—For the erection of a glass-cutting factory, St. George's-square, for Messrs. J. Grinsell & Sons, Birmingham & London. Messrs. Titley & Jones, architects, Bennett's-hill, Birmingham :—

Archer	£999 0 0
West	825 0 0
W. J. Whittall (accepted)	709 0 0

COMPETITIONS, CONTRACTS & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom Required.	Premium.	Designs to be delivered.	Page
Works at New Cemetery	Willesden Burial Bd....	50*l.* and 25*l.*	April 30th	ii.
New Offices	Oldham School Board	50*l.*, 30*l.*, and 20*l.*...	do.	ii.
College Buildings, Kingston-upon-Hull	The Governors	50 gs. and 25 gs.	May 1st	ii.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Sewerage Works, Kentish Town	London County Council	*Official*	Mar. 17th	xi.
Roadmaking Works	Finchley Local Board	do.	do.	ii.
Stone Paving	Com. of Sewers....	do.	Mar. 18th	ii.
Roadmaking Works	Lewisham Bd. of Works	do.	do.	ii.
Roadmaking Works	Southend Local Board	P. Dodd	do.	ii.
Additional Arches and Facing Brickwork of Sea Wall	Brighton Town Council	F. J. C. May....	do.	xi.
Works and Materials	Wimbledon Local Board	*Official*	do.	xi.
Supply of Materials	Carlisle Corporation ...	W. H. Smith....	Mar. 19th	ii.
Paving Works	Clerkenwell Vestry.....	*Official*	Mar. 20th	xi.
Iron Staircases	Bromley Union....	Jno. Ladds....	do.	xi.
Tailor's Shop at Cottage Home, Banstead	Kensington, &c., School District Managers.....	A. & C. Harston	do.	xi.
Wrought-iron Bridge, near Reading	Berkshire County Coun.	J. Morris	Mar. 21st	ii.
Supply of Timber	Norwich Corporation...	P. P. Marshall	Mar. 22nd	xii.
Gravel Footpaths, Clissold Park	London County Coun.	*Official*	Mar. 24th	xi.
Gravel Footpaths, Well-street Common and London Fields	do.	do.	do.	xi.
Works and Materials	Southgate Local Board	C. G. Lawson	do.	xi.
Roadmaking Works	Hendon U. R. S. A. ...	Thos. Henry	do.	ii.
Supply of Steam Coal	Colchester U. S. A.....	*Official*	Mar. 25th	ii.
Enlargement of the Norwich Post-office	Com. of H.M. Works ...	do.	do.	ii.
Works and Materials	Wood Green Local Bd.	C. J. Gunyon....	do.	xi.
Retaining Wall at Public Baths.....	Southampton Corprtn.	W. B. G. Bennett....	do.	xi
Wood Paving	West Ham Council	Lewis Angell....	do.	xii.
Convalescent Home, Broadstairs	N. Surrey School Dist. Managers.....	J. R. Vining	Mar. 29th	xii.
Sewerage Works	Manchester Corporatn.	J. Allison	Mar. 31st	xi.
Drainage of the Kew Gardens District.....	Richmond U. S. A.....	Walter Brooke	do.	xi.
Roadmaking and Sewer Works	Hanwell Local Board..	E. J. W. Herbert.....	April 1st	ii.
Erection of Sanatorium, Tiverton.....	Governors of Blundell's School	D. Young	do.	xii.
Roadmaking Works	Bromley U. R. S. A. ...	*Official*	April 2nd	xi.
Superstructure of New P.O., St. Martin's-le-Grand.....	Com. of H. M. Works ,,	do.	April 3rd	ii.
Police Station and Petty Sessional Court ...	Gloucestershire C. C....	J. Medland....	April 7th	xii.
Lock-up, &c., Bishop Stortford	County of Hertford	Urban A. Smith	April 8th	xii.
Well Sinking....	Gainsborough L. B.....	D. G. Macdonald	April 9th	xi.
New Church, Bournemouth	.....	Lawson & Donkin	Not stated	xii.
Chapel and Schools, Whitby	.....	Wm. Waddington & Son	do.	xi
New Bridge at Wellingborough.....	County of Northampton	E. Law	do.	xii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
General Road Foreman.....	St. George-the-Martyr (Southwark) Vestry...	3*l.* weekly	Mar. 18th	xvi.
Assistant Road Surveyor	Birkenhead Corporatn.	150*l.*	Mar. 19th	xvii.
Inspector of Nuisances	Newcastle-on-Tyne Cor.	200*l.*, &c.	Mar. 24th	xvii.
Clerk of Works....	Salford Corporation ...	4*l.* per week	Mar. 25th	xvii.
Sanitary Inspector	St. Matthew, Bethnal Green, Vestry	120*l.*	Mar. 26th	xvii.
Borough Surveyor and Engineer	Luton Corporation	200*l.*, &c.	Mar. 18th	xvii.
County Surveyor....	Bucks County Council	Not stated	Not stated	xvii.

EALING.—For iron roofs and castings, for the Ealing Local Board. Mr. Charles Jones, Surveyor :—

	Iron Roofs.	Iron Castings.
King, Masterman, & Terry	£500 0 0	£152 10 0
B. C. Badham & Co.	473 10 0	108 18 7
Rubery & Co.	415 10 0	178 10 0
E. C. & J. Keny	383 19 0	170 10 6
Croggon & Co., Limited..	360 0 0	—
Fredk. Braby & Co.	349 1 3	147 10 8
Alex. Martin	342 10 0	108 10 0
Wm. Glover & Sons	332 10 0	133 16 0
Brownlie & Murray	315 0 0	138 13 0
Walter Jones	318 0 0	124 5 0
F. Morton & Co., Limited	315 10 0	167 0 0
Fredk. Bird & Co.	311 15 0	113 5 0
W. Whitford & Co.	310 0 0	128 0 0
Hill & Smith	285 0 0	112 8 0
Walter Macfarlane & Co.	—	185 1 6
Allday & Onion's Pneumatic Engineering Co., Ltd.	—	147 7 6
E. Humphries, Limited	—	156 12 0
A. Handyside & Co., Ltd.	—	133 15 10
J. Bagshaw & Son	—	113 16 0
Dutton & Co., Limited	—	101 0 0
Goddard, Massey, & Warner (accepted)	253 0 0	106 10 0

[Surveyor's Estimates, £327. 10s. and £132. 19s.]

FOREST GATE.—For alterations and repairs to the "Steamship" public-house, Chatsworth-road, Forest Gate, E., for Mr. E. H. Elmy. Messrs. Saville & Martin, architects, 86 and 87, Strand, W.C. :—

S. Yardley & Sons	£396 0 0
J. & F. Bane	375 0 0
C. F. Hewlitt	364 0 0
J. Vears & Co.	319 0 0
R. Eddie	318 0 0
W. Buckle	305 0 0
C. H. Bates (accepted)	269 0 0
Pewterer's Work.	
Sanders & Sons (accepted)	37 0 0

FARNHAM.—For additions to the "Lion" Brewery, Farnham, for the Farnham United Breweries, Limited. Messrs. Inskipp & Mackenzie, architects, 5, Bedford-row, W.C. Quantities by Messrs. R. L. Curtis & Sons, 119, London Wall, E.C. :—

Martin, Wells & Co., Aldershot....	£3,448 0 0
Diamond & Sons, Farnham	3,350 0 0
Tompsett & Kingham, Farnham ..	3,203 0 0
Patman & Fotheringham, London..	3,130 0 0
Brown, Son, & Blomfield, London..	2,960 0 0
Kirk & Randall, Woolwich*	2,922 0 0

* Accepted.

HEATON NORRIS.—For new works for Messrs. R. Faulder & Co., Limited, Heaton Norris. Mr. J. D Harker, architect, 78, King-street, Manchester :—

Accepted Tenders for Ironwork, &c.

Messrs. De Bergue & Co., Limited (roofing ironwork, &c.)	£2,500 0 0
Messrs. Dorman, Long & Co. (steel joists, &c.)	800 0 0
Messrs Milburn & Co. (columns, &c.)	500 0 0

[All above tenders are on Schedule.]

LONDON.—For the reconstruction of the Olympic Theatre, Wych-street, Drury-lane, W.C., for Mr. C. Wilmot. Messrs. Crewe & Sprague, Fitzalan House, Arundel-street, Strand, and Mr. L. W. Goodwyn, Granville Chambers, Granville-place, W., architects. Quantities by Mr. William Allport, 26, Southampton-street, W.C. :—

J. W. Hobbs & Co.	£23,729 0 0
Charteris	23,246 0 0
Colls & Sons	23,024 0 0
D. Laing & Son	22,740 0 0
J. Morter	22,500 0 0
J. & H. Bywaters	22,460 0 0
Holloway Bros.	22,328 0 0
Holliday & Greenwood (accepted)	21,577 0 0
S. & W. Pattinson	21,325 0 0
Kirk & Randall	21,150 0 0
J. Godfrey & Son	20,800 0 0

LONDON.—For the erection of the Bishopsgate Girls' School, Chapel, and Curate's Residence, in Spital-square, E., including fences, heating, &c. Mr. T. Chatfield Clarke, architect, 63, Bishopsgate-street Within:—

Charles Cox	£18,735	0	0
Rider & Son	18,287	0	0
Ashby & Horner	18,093	0	0
Trollope & Sons	18,081	0	0
Dove Bros.	18,080	0	0
Hall, Beddall, & Co.	17,878	0	0
Lawrance & Sons	17,831	0	0
Holland & Hannen	17,695	0	0
Nightingale	17,432	0	0
Colls & Sons	17,240	0	0
Higgs & Hill	17,194	0	0
Woodward & Co.	17,173	0	0

LONDON.—For the erection of the superstructure and completion of Nos. 54 and 55, London Wall, and Bourne House, Copthall-avenue, E.C. Messrs. N. S. Joseph & Smithem, architects, 45, Finsbury-pavement. Quantities by Messrs. Franklin and Andrews:—

W. Shepherd	£10,973	0	0
W. Scrivener & Co.	10,888	0	0
Mark Patrick & Son	10,780	0	0
Brown, Son, & Blomfield	10,750	0	0
Mark Gentry	10,636	0	0
Ashby & Horner	10,523	0	0
Peto Bros.	10,338	0	0
J. T. Chappell	10,283	0	0
Patman & Fotheringham	10,223	0	0
E. Lawrence & Sons (accepted)	10,185	0	0

LONDON.—For alterations and additions to No. 77, Whitechapel-road, in order to adapt the same for the purposes of a model lodging-house for the Building Committee. Mr. W. Gilbee Scott, A.R.I.B.A., architect, 2, Bedford-row, W.C. Quantities by the architect:—

Hearle & Son	£7,380	0	0
W. Johnson	7,150	0	0
Scrivener	6,987	0	0
J. Morter	6,865	0	0
T. Boyce	6,785	0	0
Harris & Wardrop	6,773	0	0
F. & F. J. Wood	6,730	0	0
J. Godfrey & Son	6,678	0	0
Hearn & Co. (accepted)	6,493	0	0

LONDON.—For rebuilding No. 52, Coleman-street, E.C., for Mr. Chas. Morrison. Messrs. Gordon & Lowther, architects, 16, Finsbury-circus, E.C. Quantities by the architects:—

Patman & Fotheringham	£8,750	0	0
Simpson & Son	8,572	0	0
Colls & Son	8,245	0	0
J. Jarvis & Sons	8,205	0	0
Little	8,053	0	0
J. Godfrey & Son	7,330	0	0
H. Dye (accepted)	7,330	0	0

LONDON.—For alterations and additions at High-street, Kilburn, for Mr. Roper. Mr. W. T. Farthing, architect:—

Wall Bros.	£4,297	0	0
Burman	4,177	0	0
Holloway	3,990	0	0
Balaam Bros.	3,976	0	0
Scrivener	3,890	0	0
Leslie	3,863	0	0
Godfrey	3,814	0	0
Shurmur	3,798	0	0
J. Allen	3,777	0	0
Oldrey	3,767	0	0
Todd	3,690	0	0
Spencer	3,684	0	0

LONDON.—For the construction of dock and foot-bridge at the western end of the Putney Embankment, for the Wandsworth District Board of Works. Mr. J. C. Radford, A.M.I.C.E., surveyor. Quantities by Mr. W. E. Stoner, 5 and 6, Bucklersbury, E.C.:—

Kirk & Randall	£4,118	0	0
Perry & Co.	4,086	0	0
William Webster	3,938	0	0
Ball & Gammon	3,547	0	0
Dickinson	3,210	0	0
Geo. Munday & Sons	3,155	0	0
Thos. Docwra & Sons	2,660	0	0
Williams, Son, & Wallington*	2,660	0	0

* Accepted. Surveyor's estimate, £2,700.

LONDON.—For the erection of Mission Church, Shacklewell-lane. Mr. John Hamilton, architect:—

Grover	£1,950	0	0
Goodall	1,833	0	0
W. Shurmur	1,827	0	0
Beale	1 643	0	0
Dabbs	1,584	0	0
Godfrey	1,473	0	0
Jarvis	1,462	0	0
Chessum	1,382	0	0

LONDON.—For rebuilding No. 324, Holloway-road, N., for Mr. Reuben Loomes. Mr. Whitehead, architect:—

J. Langham	£2,173	0	0
Hoggod	2,026	0	0
Houghton & Sons	1,897	0	0
J. Allen & Sons	1,883	0	0
W. Shurmur	1,764	0	0
Macfarlane	1,743	0	0
Chessum	1,651	0	0
Newton & Co.	1,545	0	0

LONDON.—For constructing brick and pipe sewers on the Northolme Estate, Highbury New Park, N., for Messrs. J. Edmondson & Son, under the Vestry of St. Mary, Islington. Mr. J. P. Barber, C.E., Surveyor:—

Wildmon Brothers, Finsbury Park, N. (accepted)	£1,563	0	0

LONDON.—For pulling down No. 4, Little Pulteney-street, Soho, and rebuilding same for Mr. Walter Justice. Mr. W. Gilbee Scott, architect, 25, Bedford-row, W.C. Quantities by the architect:—

W. Rowe	£2,547	0	0
D. Lang & Son	2,490	0	0
W. Downs	2,398	0	0
T. Boyce	2,380	0	0
W. Hearn & Co.	2,379	0	0
W. Scrivener	2,266	0	0
Harris & Wardrop	2,237	0	0
Bywaters	2,350	0	0
G. Godfrey & Son	2,137	0	0
W. Johnson (accepted)	2,100	0	0

LONDON.—For pulling down and rebuilding No 56, Great Titchfield-street, W., for Messrs. W. H. & C. Chalfont. Mr. Walter Miller, architect, 182, Oxford-street, W. Quantities by the architect:—

Watson	£2,589	0	0
Whetherilt, Lee, & Martin	2,498	0	0
Williams & Son	2,479	0	0
Adamson	2,381	0	0
Bywaters	2,350	0	0
J. Godfrey & Son	2,044	0	0
Stevens	2,030	0	0

LONDON.—For erecting warehouse at Hackney, for the Dublin Bottling Company. Mr. J. Hamilton, architect:—

Prater	£2,104	0	0
G. W. Beale	1,970	0	0
Eli Wilson	1,933	0	0
Wm. Shurmur	1,890	0	0
Godfrey & Son	1,887	0	0

LONDON.—For pulling down and rebuilding the "Eagle Tavern," Chatham-road, Wandsworth Common, for Messrs. Matthews & Canning. Messrs. Karslake & Mortimer, architects and surveyors, 5, Great Queen-street, Westminster:—

Potterton	£1,896	0	0
Buchanan	1,658	0	0
MacLachlan & Son	1,625	0	0
W. F. Picken, Chelsea	1,589	0	0
McCormack & Sons	1,585	0	0
Holloway Bros.	1,552	0	0

LONDON.—For erecting new warehouse, Fulwood's-rents, Holborn, W.C., for Messrs. Watson & Sons. Mr. Henry L. Florence, architect, 3, Verulam-buildings, Gray's Inn, W.C. Quantities by Mr. J. F. Bull, 30, Bedford-row, W.C.:—

B. Wire	£2,210	0	0
Worsley	1,997	0	0
Atherton & Latta	1,985	0	0
Harris & Wardrop	1,948	0	0
J. Jarvis & Sons	1,870	0	0
J. Godfrey & Son (accepted)	1,844	0	0

LONDON.—For alterations and additions to No. 6, Bentinck-street, W., for Miss Snasdelle. Mr. C. H. Worley, architect. Quantities by Mr. R. C. Gleed:—

Amended tender.

G. H. & A. Bywaters (accepted)	£1,578	0	0

LONDON.—For alterations and additions to No. 5, Bentinck-street, W., for Mr. Saml. Lithgow. Mr. C. H. Worley, architect. Quantities by Mr. R. C. Gleed:—

Amended tender.

G. H. & A. Bywaters (accepted)	£1,620	0	0

LONDON.—For painting, cleaning, &c., the interior of the South-Eastern Hospital, New Cross, S.E., for the Metropolitan Asylums Board. Messrs. H. Jarvis & Son, architects, 29, Trinity-square, S.E.:—

W. & H. Castle, Southwark	£2,293	0	0!
W. F. W. Small, Green-lanes, N.	2,279	18	10
J. Vaughan, Pimlico	1,886	10	0
J. J. Richards, St. David's-street, Boro'	1,848	0	0
C. G. Wright, Cricklewood	1,795	0	0
Godson & Sons, Kilburn	1,650	0	0
W. Reason, St. John-street, Clerkenwell	1,635	0	0
W. G. Lilly, Whitcombe-street, W.C.	1,457	0	0
M. Batchelor, Maidstone	1,354	0	0
W. S. Hadlow, Dover	1,300	0	0
R. H. Bax, Highbury	1,210	0	0
L. Wallace, Sutton (accepted)	975	0	0
Fords, Southwark	355	10	0!!

LONDON.—For sanitary and decorative works to No. 23a, Sussex-square, W., for Mr. E. Bacon. Mr. Walter Graves, architect, Winchester House, E.C.:—

White & Co.	£679	0	0
Shaw	598	0	0
Siegmann	522	0	0
Nightingale (accepted)	514	0	0

LONDON.—For redecorating and repairs at the "Duke of Argyll," Great Windmill-street, W., for Mr. A. C. Mills. Mr. J. F. Wesley, architect, Forest-gate:—

Bishop & Webb	£165	10	0
Clapton	152	10	0
A. & W. Garnar, Peckham*	114	0	0

*Accepted.

LONDON.—For building an additional story to No. 21 Wilton-road, Pimlico, S.W., for Mr. Rees Taylor. Messrs. Saville & Martin, architects, 86 and 87, Strand, W.C.:—

E. H. Harris	£210	0	0
T. Coulthard	199	0	0
C. H. Bates	159	0	0
Bowles (accepted)	128	0	0

LONDON.—For making up and paving roads in the Parish of Fulham. Mr. W. Sykes, New Streets Surveyor:—

Gilstead-road.

Bowles, Battersea	£910	0	0
Nowell & Robson, Kensington	613	0	0
Tomes & Wimpey, Hammersmith	603	0	0
Mears, Kensington	596	0	0
Serff, Hoile, & Co., Chiswick	572	0	0
Neave & Son, Paddington	537	0	0
Coat, Hammersmith	491	0	0

Whitlingstall-road.

Bowles, Battersea	420	0	0
Nowell & Robson, Kensington	337	0	0
Serff, Hoile, & Co., Chiswick	315	0	0
Tomes & Wimpey, Hammersmith	304	0	0
Mears, Kensington	293	0	0
Neave & Son, Paddington	273	0	0
Coat, Hammersmith	268	0	0

LONDON.—For pulling down and rebuilding back addition and sundry repairs at 1, 2, 10, and 12, Market-place, Underhill-road, East Dulwich. Mr. Alfred Wright, architect, 61, Kennington-road:—

Nixon	£275	0	0
Hollingsworth	230	0	0
Ford & Son	228	0	0
Battley	224	0	0
G. Godson & Sons, Kilburn	208	10	0
Grenville	175	0	0

LONDON.—For the supply of granite kerbs, pitching, channelling, macadam for roads, Yorkshire stone flags, Patent indurated stone flags, cartage of materials, and the masons' and paviors' work for one, two, or three years, from March 25, 1890, for the District Boards of Bow, Poplar, Bromley-by-Bow, and the Isle of Dogs.

Lewis Griffiths, Millwall, E., schedule of prices (accepted).

LONDON.—For the erection of artisans' dwellings, Richard's-place, Old-street, E.C. Messrs. Edmeston & Gabriel, architects, 42, Old Broad-street. Mr. G. R. Tasker, surveyor, 33, John-street, Bedford-row:—

Quarterman	£986	0	0
Shepherd	876	0	0
Patman & Fotheringham	874	0	0
Taylor	839	0	0
Scott	809	0	0
Smith & Son	796	0	0
Young & Lonsdale	766	0	0

LONDON.—For the construction of a new road and sewer, on the Old Park-avenue Estate, Nightingale-lane, S.W. Messrs. N. S. Joseph & Smithem, architects, 45, Finsbury-pavement, E.C.:—

L. Bottoms, Wandsworth-common	£722	0	0
R. Mayo & Co., Brixton	560	0	0

LONDON.—For erecting a new proscenium to the stage of concert-hall, and for re-decorating, gilding, and other works to hall, supper, and dressing-rooms, also concert-hall, at the Queen's Gate Hall, Harrington-road, South Kensington. Messrs. Rogers, Chapman, & Thomas, surveyors, 50, Belgrave-road, South Belgravia, S.W.:—

Aldin Bros. & Davies	£353	0	0
W. R. Manders	323	0	0
J. Douglas	313	0	0
H. Smith & Son	312	0	0
E. D. Hook (accepted)	280	0	0

NEWCASTLE-ON-TYNE.—For building St. Jude's Church, Newcastle-on-Tyne. Mr. A. B. Plummer, architect, Newcastle. Quantities by Mr. Geo. Connell, Grainger-street, Newcastle:—

E. Weatherley, Newcastle	£4,003	0	0
E. B. Reed, Newcastle	3,853	5	7
Jos. Elliot, North Shields	3,818	0	0
Tyrie & Graham, Newcastle	3,763	0	0
S. R. Burton, Newcastle	3,754	13	6
Middlemiss Bros., Newcastle	3,620	10	0
Haswell & Waugh, Newcastle	3,618	0	0
J. & W. Lowry, Newcastle	3,488	10	0
J. T. Simpson, Newcastle	3,452	11	6
R. & R. Reed, Newcastle	3,441	10	5
G. Scott & Son, Newcastle	3,383	19	3
J. Shepherd, Durham	3,363	3	0
W. Baston, New Bridge-street, Newcastle (accepted)	3,260	1	6

NEWCASTLE-ON-TYNE.—For new workshops, &c., at the corner of Forth and South streets, Newcastle-on-Tyne, for the Gas Company. Mr. A. B. Plummer, architect 46 Cloth Market, Newcastle. Quantities by Mr. Geo. Connell, Grainger-street, Newcastle:—

J. & W. Lowry [lowest] (accepted)	£2,189	5	0

NEWCASTLE-ON-TYNE.—For alterations to premises, Clayton-street, Newcastle. Mr. Arthur B. Plummer, architect, 46, Cloth Market, Newcastle:—

J. M. Wilson [lowest]	£175	10	0

RICHMOND.—For the completion of No. 2 Contract of the drainage works. Mr. Mellis, C.E., engineer:—

S. E Bentley	£19,674	12	6
H. Hill	48,990	0	0
A. Kellett	40,193	3	3
A. Mears	39,717	0	0
T. Adams	37,576	12	11
W. J. Botterill & Co.	35,987	0	0
H. Dickson	35,966	0	0
Nowell & Robson (accepted)	34,085	0	0
Holme & King	33,797	18	4

RUDGWICK (Sussex).—For two pairs of cottages at Arun Bank. Mr. Benj. Tabberer, architect, 13, Basing-hall-street, E.C. Quantities by Messrs. Franklin & Andrews, 25, Ludgate-hill, E.C.:—

Waddington & Co., Sydenham	£1,057	0	0
King Bros., Rudgwick	983	17	5
Peters, Horsham	900	0	0

SALFORD.—For erecting the Ladywell Sanatorium, Salford. Messrs. Maxwell & Tuke, and E. & F. Hewitt, joint architects, 29, Princess-street, Manchester :—

	Sanatorium Buildings.	Gardening and Road-making.
G. Parkinson	£35,047 0 0	2,307 19 0
S. & W. Pattinson	31,982 0 0	802 0 0
A. Bleakley & Sons	30,548 0 0	£833 0 0
Storr & Sons	27,689 0 0	999 0 0
W. A. Peters & Sons	27,249 0 0	1,700 0 0
J. Byrom	26,478 0 0	635 0 0
Allen Holmes	26,460 0 0	845 0 0
W. Southern & Sons	26,265 0 0	1,100 0 0
R. Neill & Sons *	25,965 0 0	680 0 0

* Accepted.

Terra Cotta.

Monk & Newel *	£988 19 1
J. C. Edwards (accepted)	971 12 7

Concreting.

Dunbar Kelly	£2,905 3 2
H. H. Morton	1,362 0 0
Hamor Lockwood	1,298 0 0
Hindley & Co. (accepted)	1,171 0 0

Bell Hanging and Lightning Conductor.

Rudale	£171 0 0
Baker	148 0 0
Wilson	136 0 0
Rowbottom (accepted)	124 15 0

SIDMOUTH.—For building new farm-house, Upper Chelson, Sidbury Manor, Sidmouth. Mr. Walter F. Cave, architect, 8, George-street, Portman-square, W. :—

Turner & Skinner, Honiton*	£710 0 0
Holmes & Tozer, Exeter	690 0 0
E. Carnell, Ottery St. Mary	650 0 0
S. Seward, Sidmouth	522 0 0

* Accepted.

SOUTHALL (Middlesex).—For new school for 300 boys at Featherstone-road, Southall, Middlesex, for the Norwood Middlesex School Board. Mr. Thos. Newell, architect. Quantities by Messrs. Young & Brown :—

	School Building.	Walls, Latrines, and Play-ground.	Total.
J. W. Falkner	£3,732	£1,647	£5,379
T. Nye	3,238	1,419	4,657
Wm. Down	—	—	4,500
C. F. Kearley	3,141	1,300	4,441
J. Doray	3,050	1,250	4,300
G. Gibson	3,076	1,163	4,239
Wm. Brown	2,940	1,180	4,120
A. & B. Hanson*	2,778	1,076	3,854

* Accepted.

SOUTHALL (Middlesex).—For three shops and dwelling-houses in High-street, Southall, Middlesex. Mr. Thos. Newell, architect. Quantities by Messrs. Young & Brown :—

T. Nye, Ealing	£3,140 0 0
H. & A. J. Jones, Ealing	3,047 0 0
A. & B. Hanson, Southall	2,935 0 0
W. Brown, Southall	2,869 0 0
E. F. Kearley, Uxbridge	2,858 0 0
J. Dorey, Brentford	2,800 0 0
Bailey, Ealing	2,798 0 0
G. Gibson, Southall	2,744 0 0

Reduction Estimates.

Dorey	2,500 0 0
Gibson	2,476 0 0
Bailey (accepted)	2,443 0 0

THIRSK.—For additions, &c., to mansion, Thirkleby Park, near Thirsk, for Lady Payne Frankland. Messrs. William Lewis & Son, architects, 46½, Stonegate, York. Quantities by the architects :—

James Thackray, Ripon	£2,288 0 0
John Keswick, Micklegate, York	1,986 0 0
Thomas Hodgson, Greengate, Malton	1,971 16 8
John Wilson & Son, Walmgate, York	1,929 0 0
Clarke & Ward, York	1,836 0 0
George Shepherd, Escrick, York	1,831 0 0
Wm. Bellelby, York	1,822 0 0
Joseph Clark, York	1,543 0 0
George Manfield, Thirsk	1,427 0 6
C. K. Manfield, Thirsk	1,388 6 3
Benjamin Hughes, York	1,355 10 0

SUDBURY (Middlesex).—For sundry decorative works to "The Hale," for Mr. A. Hicks. Mr. Walter Graves, architect, Winchester House, E.C. :—

Oldrey & Co.	£135 0 0
Tompkins	97 5 0
Siegmann	96 10 0

WOLVERHAMPTON. — For erecting the "Vine" Inn, Stafford-street, for Messrs. Wm. Butler & Co. Mr. Arch. Paull Brevitt, architect :—

Henry Willcock, Wolverhampton	£3,985 0 0
Henry Lovatt, Wolverhampton *	3,960 0 0

* Accepted.

WORCESTER.—For new tun-room, cooperage, boiler-house, and stables, for Messrs. Lewis, Clarke, & Co.'s Brewery, Worcester. Messrs. Scamell & Colyer, architects, 18, Great George-street, Westminster, S.W. Quantities by Messrs. R. L. Curtis & Sons, London-wall :—

No. 1.—Building.

J. Wood & Sons, Worcester	£3,729 0 0

Stables.

J. Wood & Sons, Worcester	727 0

No. 2.—Ironwork.

Thornewill & Warham, Burton-on-Trent	1,330 0 0
Moreland & Sons, London	1,434 0 0

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